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THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

THE SIXTEENTH ANNUAL MEETING OF THE PACIFIC DIVISION

By Dr. J. MURRAY LUCK, Secretary

THE sixteenth annual meeting of the Pacific Division of the American Association for the Advancement of Science and Associated Societies was held from June 15 to 18, in Pullman, Washington, where the division was entertained by the State College of Washington. Though far from the larger centers of population in the West, the meeting was exceptionally well attended and of high quality throughout. Of the total registration of 510, 200 were from outside of Washington and Idaho.

The State College of Washington is situated but ten or twelve miles distant from its sister institution in Moscow—the University of Idaho—which warmly cooperated in various matters pertaining to the meeting. Both institutions serve the rich agricultural section commonly known as the "Inland Empire," an area of great fertility interrupted by regions of marked geological and scenic interest.

The sessions commenced on the afternoon of June 15 with reviews of the scientific contributions of the past year. The purpose of these surveys, now adopted as a recognized part of the divisional program, is to describe the scientific researches in progress in the universities of the West, in the light of their relationship to the engrossing problems of current interest within the sciences at large.

The preparation of such reviews and their presentation within the restricted time available is admittedly a difficult task, requiring a speaker to confine his attention to but two or three of the problems of major interest, or to enumerate without critical evaluation most of the investigations proceeding in the different

institutions. The former has come to be regarded as the preferred method. Dr. J. S. Plaskett's review on astronomy and astrophysics was read by Dr. F. J. Neubauer, of the Lick Observatory, while that pertaining to the animal sciences, prepared by Professor J. E. Guberlet, of the University of Washington, was read by Professor Melville Hatch. Surveys of the current research in chemistry, physics and the plant sciences were presented by Professor J. B. Ramsey, of the University of California at Los Angeles, Professor W. V. Houston, of the California Institute of Technology, and Professor G. J. Peirce, of Stanford University, respectively.

Later in the afternoon, through the courtesy of the General Electric Company, two excellent sound films were presented—one by Dr. I. Langmuir, "Oil Films on Water," and the other by Lord Rutherford, "Constitution and Transformation of the Elements." About 350 attended these opening sessions.

In the evening, Professor A. O. Leuschner, of the University of California, presented his retiring address as president of the Pacific Division on "The Astronomical Romance of Pluto." Prior to President Leuschner's address, Dr. E. O. Holland, president of the State College of Washington, formally welcomed the association and its guests to the college, to which Professor E. G. Martin, vice-president of the Pacific Division, gave reply.

The morning of Thursday, June 16, was devoted to a symposium on "Scientific Problems of the Columbia Plateau," in which most of the societies participating in the Pullman meeting joined.[1]

Professor F. L. Pickett, head of the department of botany, State College of Washington, gave an illustrated address on "Interesting Botanical Areas." Going outside the limits of the Columbia Plateau, he gave a brief account of the widely different conditions affecting plant growth in the state of Washington and contiguous territory, and called attention to the opportunities for investigation in the fields of systematic botany, plant physiology and plant ecology. Of special interest are the great areas of humid plains, semi-desert and mountains, in which very little collecting has been done, and the easily accessible regions where xerophytic forms may be studied under natural conditions. "Geological Problems" was the subject discussed by M. G. Hoffman, assistant professor of petrology, State College of Washington. Using lantern slides as illustrative material, the speaker left in the minds of his hearers clear-cut impressions of the principal geological features of the Columbia Plateau. Avoiding discussion of controversial points, he indicated the nature of problems now under investigation. E. F. Dummeier, professor of economics, State College of Washington, spoke on "Economic and Agricultural Problems of the Wheat and Apple Industries." These problems were classified under four heads: (1) "Reduction of Costs of Production"; (2) "Reduction of Costs of Marketing"; (3) "Enlargement of Markets and Freeing Them from Present Restrictions"; (4) "Removal of Restrictions with Freedom of Production of the Commodities Purchased by the Farmer."

Wheat and apples provide two thirds of the cash income from crops of the state of Washington. One half of the wheat and one fifth of the apples are exported to foreign nations. The development of high-yielding and smut-resisting varieties of wheat and improved types of machinery have lowered costs of production. Apple yields in this region are far higher than in any other part of the nation: nevertheless, present prices are below average production costs. Foreign markets have been restricted by tariffs, quotas, licenses and regulation of the sale of exchange. For the most part foreign tariffs are high; in many cases imports are prohibited. These restrictions work a great hardship on a region such as this which, under the principle of comparative advantage, is much better adapted to the production of these crops than of others. "Engineering Problems" was the topic presented by Professor Ivan C. Crawford, dean of the college of engineering, University of Idaho. The outstanding engineering problems of the Columbia Plateau are those of power development and irrigation. To bring the per acre cost of irrigation development within a reasonable figure, power must be sold at a rate which will amortize the cost of its own development and in addition pay a larger proportion of the cost of constructing irrigation projects. The sums involved are so immense, said Dean Crawford, that only the Federal Government can furnish the necessary financial aid. It is proposed that the Government develop the power and distribute it at wholesale rates to private utilities and municipalities. Estimates indicate that the power and irrigation development of the Columbia Basin should pay out in fifty years.

From 4 to 6 P. M., Dr. E. O. Holland, president of the State College of Washington, received the members and guests of the Pacific Division and associated societies. In the evening, Professor J Harlen Bretz, of the University of Chicago, presented an address before the division at large on "The Scablands of the Columbia Plateau in Washington." The principal geological features of the area were discussed and suitably illustrated by the use of numerous lantern slides. The evidence pertaining to the author's theory of a catastrophic flood was ably outlined. To provide an opportunity for further discussion of the theory

[1] Professor C. C. Todd kindly prepared the report on the symposium.

a special session was held on Friday morning under the auspices of the Western Society of Naturalists, at which various hypotheses were critically considered.

The concluding evening address, on "Historic Approaches to Nature," was presented on Friday, June 17, by Dorothea W. Singer, of the University of London:

Science is a unifier of mankind, independent of race, creed or nationality, for it deals with judgments to which universal assent can be obtained from all those equipped with adequate knowledge and intelligence. Yet it would be a mistake to regard science as a static body of knowledge, fixed and unchangeable. Its true nature is rather indicated by the adjective *scientific, science-making*, since all scientific knowledge must be progressive knowledge. Its third characteristic is accuracy to within a known limit. Finally, the subject-matter of science is usually limited to the world of nature, that is to say, the physical world around us rather than the world as modified by mankind.

While earlier civilizations show some scientific knowledge, the religion of science, faith in an ordered universe, was the achievement of the Greek culture. Yet Greek science was hampered by too close an alliance with cosmic speculation and philosophy. The rise of modern science, on the other hand, has been associated with concentration on limited problems. This has led to specialization, which has brought its own pitfalls.

As general education becomes more scientific, it may be hoped that the literary man will be illumined by the scientific view-point, while the man of science will find himself by association with the humanistic and esthetic approach to phenomena. Enlightenment from both disciplines should thus reach the "man in the street."

Modern science has a better chance of preservation for posterity than had Greek science, because in modern scientific expositions, unlike those of the Greeks, not merely the results but also the method of attainment of scientific knowledge is set forth.

Nine excursions to adjacent areas of scientific interest were made during the latter part of the week. The most popular were the trips to Bald Butte, Lewiston and the scablands. Bald Butte is an outlying stock of Idaho batholith situated about nine miles southeast of Pullman. It is an inlier of Jurassic age, surrounded by Columbia lavas, which are in turn overlaid by the Palouse loess. From its peak a splendid unobstructed view of the surrounding country could be obtained.

The tour of the scablands was conducted by Professor Bretz, who since 1922 has made this area the subject of intensive study. The trip extended over two days—ending at the great bar on the south side of the Snake River, near Lyon's Ferry, which some regard as impressive and almost irrefutable evidence of an unusual flood. On Friday afternoon, many availed themselves of the opportunity to visit Lewiston and the State University of Idaho, situated at Moscow.

Business sessions of the Pacific Division, A.A.A.S., the executive committee and the affiliation committee were held. At the general business session on June 16, Dr. E. P. Meinecke, of San Francisco, was elected to the executive committee in succession to Mr. Bernard Benfield, who retired after many years of service. A resolution of gratitude for the warm hospitality of the State College of Washington was unanimously adopted. Announcement was made that the 1933 meeting would be held in Salt Lake City under the auspices of the University of Utah. It was agreed that the time of the meeting should be fixed with reference to the Chicago meeting of the American Association (June 19–30) so that members attending the Salt Lake City meeting would be able, if they so desired, to proceed to Chicago for the meetings there. At the meeting of the executive committee on June 17, Dr. W. F. Durand, professor of mechanical engineering, emeritus, of Stanford University, was elected to the presidency of the division for the ensuing year.

Professor W. E. Bradt, Professor P. A. Anderson, Dr. H. E. Culver, Dean Florence Harrison, Helen G. Smith, Professor F. D. Heald and Dean C. C. Todd served as chairmen of the committees in charge of the local arrangements.

The reports of the scientific sessions of participating societies follow:

American Association of Cereal Chemists, Pacific Northwest Section

(Report by J. L. St. John)

The fourth annual meeting was opened with an address by the president, W. O. Whitcomb, of the University of Montana. A feature of the Friday morning session was a question-discussion meeting at which a variety of topics of importance to cereal chemists was considered.

In addition to many interesting papers presented by its members, the section was fortunate in having a number of papers from Eastern authorities on cereal chemistry. Dr. D. A. Coleman, of the U. S. Department of Agriculture, submitted a paper on "Recent Developments in Electric Moisture Determination Devices." Dr. E. B. Working, of Kansas State College, submitted a paper on a "New Dough Mixer." Dr. C. H. Bailey, University of Minnesota, recent recipient of the T. B. Osborne medal for distinguished contributions to cereal chemistry, attended the sessions and presented a paper on "An Automatic Method for Measuring the Expansion of Doughs." On Thursday evening the section attended the general chemistry banquet, and on Friday evening

held a cereal chemists' banquet, attended by about 25. Friday afternoon a visit was made to the campus of the University of Idaho at Moscow. Following an inspection of the campus and laboratories, a lecture, entitled "Bread and Water," by Dr. Bailey, was enjoyed.

The sessions closed on Saturday noon with an election of officers. John W. Clulow, of Portland, was elected president, O. W. Walker, of The Dalles, Oregon, vice-president, and E. P. Walker, of Portland, secretary-treasurer. The meeting next year will be held in Portland.

AMERICAN CHEMICAL SOCIETY, PACIFIC INTERSECTIONAL DIVISION

(Report by J. L. St. John, Chairman of Program Committee)

The fifth annual meeting of the Pacific Intersectional Division of the American Chemical Society was held on June 16 and 17, at the State College of Washington, in conjunction with the sixteenth annual meeting of the Pacific Division of the American Association for the Advancement of Science. The sections participating were California, Montana, Northwestern Utah, Oregon, Puget Sound, Sacramento, Southern California and the Washington-Idaho Border.

At the opening general session three papers were presented. The first paper, on "A Study of the Reversibility of the Hydrogen Electrode," was by H. V. Tartar and S. P. Todd, of the University of Washton. The second paper discussed "The Conversion of Fatty and Waxy Substances into Petroleum," and was presented by W. Seyer, of the University of British Columbia; while the third, "The Universal Occurrence in Living Matter of an Acid Substance which Stimulates Yeast Growth," was by Roger J. Williams, Carl M. Lyman, George H. Goodyear and John U. Truesdail, of the University of Oregon.

The general session was followed by a meeting of two groups, one composed of those interested in general, physical, analytical and industrial chemistry, while the second group included those interested in organic and biochemistry. The following program was presented before these groups:

GROUP I

Phase rule study of mixed derivatives of alcohols: W. E. CALDWELL and K. R. MACLEAN, Oregon State College.

Studies in absorption: W. L. BEUSCHLEIN and A. R. BOZARTH, University of Washington.

Use of the glass electrode in non-aqueous solutions: G. ROSS ROBERTSON, University of California at Los Angeles.

The structure of cellulose acetate gels from studies of diffusion: LEO FRIEDMAN and KARL KLEMM, University of Oregon.

The stoichiometric behavior of gelatin solutions: LEO FRIEDMAN, University of Oregon.

Conductivity measurements of mucic acid and alkali mucates: A. W. MARTIN, University of Idaho.

On the adsorption of $NiCl_2$ by finely divided nickel: OTTO TURINSKY, University of Idaho.

X-ray examination of the structure of para-di-iodobenzene: KERMIT GROVES, Washington Agricultural Experiment Station.

The determination of sulfur in lime-sulfur sprays: WILLIAM E. CALDWELL, Oregon State College.

A modified hook-up for the routine use of the glass electrode: E. C. GILBERT and ALAN COBB, Oregon State College.

Determination of iodine, nitrates and nitrites in sea water: L. H. EVANS and T. G. THOMPSON, University of Washington.

The use of a thermionic titrometer in the determination of lead: R. W. GELBACH and HENRY MAHNCKE, State College of Washington.

The qualitative and quantitative separation and determination of barium, strontium and calcium: A. H. KUNZ and VERNON WHITE, University of Oregon.

Silver oxalate as an oxidimetric standard: A. H. KUNZ and HENRY OTTO, University of Oregon.

A method for the preparation of telluric acid: L. I. GILBERTSON, State College of Washington.

The volatilization of copper during reduction of the oxide: M. J. MARSHALL, University of British Columbia.

Investigation of a mercury vapor lamp for accelerating the bleaching action of dibenzoyl peroxide: C. H. BAILEY, University of Minnesota.

Evaporation of waste sulfite liquor by submerged combustion: F. H. CONRAD, University of Washington.

The adsorption of water by cements: R. H. JONSON, Oregon State College.

Dissolved silicon in sea water of the Strait of Juan de Fuco and the San Juan Archipelago: T. G. THOMPSON and HAROLD HOULTON, University of Washington.

The boron content of sea water: M. W. HARDING and E. G. MOBERG, The Scripps Institution of Oceanography, La Jolla, California.

The free energy, heat content and entropy of bromine chlorides: P. D. BRASS and D. M. YOST, University of California at Los Angeles.

The physico-chemical properties of selenium and tellurium fluorides: W. CLAUSSON and D. M. YOST, University of California at Los Angeles.

On the revision of the specific heats of elements and compounds, based upon the law of mathematical probability: GEORGE A. LINHART, Riverside Junior College, Riverside, California.

The physico-chemical properties of iodine cyanide: D. M. YOST and W. E. STONE, University of California at Los Angeles.

GROUP II

The preparation of tri-p-tolyl selenonium dioxide: W. E. BRADT, State College of Washington.

The optical properties of carotenes from different sources: JAMES H. C. SMITH, Carnegie Institution of Washington.

Effect of sulfurous acid on the corrosion of monel metal by grape juice: E. M. MRAK, University of California.

Need for improved methods for the isolation and purification of lignin: E. C. JAHN, University of Idaho.

Chemical composition of Pacific Coast cranberries: JANICE M. CONKLIN and R. P. COPE, State College of Washington.

The use of sodium thiosulphate as an agent for the elimination of arsenic in a case of arsenic poisoning: OTTO TURINSKY, University of Idaho.

A study of the vitamin A content in yellow-tissued and white-tissued varieties of apples: MYRA T. POTTER, State College of Washington.

Avian metabolism of calcium and phosphorus: CLAYTON KEMPF, Washington Agricultural Experiment Station.

The preparation and study of l-cystine: J. D. PATTERSON, Oregon State College.

On the heterogeneity of crystalline insulin: J. MURRAY LUCK and BURT DAVIS, JR., Stanford University, California.

The mechanism of polymerization reactions: WILLIAM CHALMERS, Vancouver, B. C.

The effect of solutes upon the expansion of starch granules: AGNES F. MORGAN and G. M. NEVENZEL, University of California.

The preparation of derivatives of uric acid, particularly alloxantin: MORSE WALDORF and O. E. SHEPPARD, University of Montana.

Following a chemists' dinner Thursday evening, at which about 85 were present, an announcement of the winners of the intersectional high-school contest was made. Preliminary elimination contests were conducted by various sections within their own area. The contest was conducted by Dr. J. H. Norton, of Sacramento Junior College, Dr. C. R. Kinney, of the University of Utah, and Dr. Johnson, of Willamette University. The trophy was awarded to the team from the High School of Montesano, Washington.

At the close of the Friday morning session the chemistry group was taken to the University of Idaho by car. After lunch in Moscow and a tour of the campus and laboratories, the section attended a lecture by Dr. C. H. Bailey, professor of agricultural biochemistry of the University of Minnesota, and recent recipient of the Thomas Osborne medal for distinguished contributions to cereal chemistry.

At the business session, Dr. C. R. Kinney, of the University of Utah, was elected a member of the intersectional committee to succeed Dr. O. F. Stafford, of the University of Oregon, whose three-year term expires. The personnel of the executive committee, Pacific Intersectional Division of the American Chemical Society, for the coming year will therefore be: Dr. G. Ross Robertson, of the University of California at Los Angeles, *chairman;* Dr. J. L. St. John, State College of Washington; and Dr. C. R. Kinney. Dr. Kinney will be chairman of the program committee for the intersectional meeting to be held next year at the University of Utah, Salt Lake City.

AMERICAN ASSOCIATION OF ECONOMIC ENTOMOLOGISTS, PACIFIC SLOPE BRANCH

(*Report by H. A. Scullen*)

The meeting of the Pacific Slope branch of the American Association of Economic Entomologists was attended largely by entomologists from the Pacific Northwestern states. The meetings extended from 9:30 A. M. on June 16 through the afternoon of that day and the forenoon of June 17. The usual entomologists' dinner was held on the evening of June 16 with an attendance of about 40. Following a short business meeting on the opening forenoon several papers were presented on the wireworm problem. Russell F. Lehman presented a paper on the laboratory and field experiments with various attrahents against the adults of *Limonius canus* and *L. californicus.* The author reported that approximately 200 essential oil and aromatic compounds were tested in the laboratories and the most promising ones were further tested in the field. The same author reported on experiments with various poison baits against the larvae of *Limonius canus.* W. C. Lane gave two papers, one entitled "Carbon Bisulfide as a Control for Wireworms," in which he gave the results of further study on the use of this gas as a soil fumigant. The second paper by the same author and his assistants presented the results of a study of wireworm populations in soils. Roy E. Campbell and N. W. Stone reported on work with chloropicrin and sulfur in connection with wireworm control work. The former gave promising results, while the latter proved to have no effect on the wireworm population. A. O. Larson and Frank E. Hinman gave a brief report on the results of the study of the population of insects in cultivated fields following the harvest of a pea crop in the Willamette Valley. B. G. Thompson reported that a liquid extract of pyrethrum (Pyrocide 20) with diatomaceous earth proved effective in the control of several insects, including *Diabrotoica soror* and tent caterpillars. It was not effective as a control for the pea aphis. George M. Lift gave a brief report on the introduction and colonization of the parasite *Trichogramma minutum* Riley in codling-moth control in the orchards of Colorado. E. J. Newcomer reported on recent studies of the life history and injuries of the pear leaf blister mite as found in the West. A. L. Strand offered some suggestions on the physiological actions of oil sprays. R. H. Robinson presented a paper on water-soluble

arsenic in oil emulsion-lead arsenate combination sprays, calling attention to the excessive amounts of water-soluble arsenate that are liberated under certain conditions. D. E. Penney presented a paper setting forth the results of a study showing the relation of the navel orange to oil sprays which has been carried on for several years.

Ralph Schott and Charles F. Doucett reported the finding of *Liothrips vaneeckei* Preistner in the Northwest. Randall Latta reported favorable results with the use of vapor heat in the treatment for the control of narcissus pests. R. L. Webster reported on the potato flea beetles, *Epitrix cucumeris* Harris and *E. subcrinata* Laconte. The former is more limited in its distribution and more injurious to the tubers. The latter is more generally distributed and feeds more upon the roots of the potato. Walter Carter reported on new methods developed in the control of the pineapple mealy bug in the Hawaiian Islands. The same author reported briefly on the results of a study of tobacco dust in the control of yellow spot disease of pineapple. Charles E. Woodruff reported that he had found a very marked effect on the honey-bee by changes in atmospheric pressure, which they can usually compensate for over a fairly wide range. The same author reported on studies made on the conditions affecting the growth of wireworms. Robert E. Wall presented a discussion of pale western cutworm population trends as related to drouth periods in Montana. Frank F. Cowan presented a paper on the variance method and its use in analyzing certain entomological data. The application of this method in the study of the results of grasshopper bait experiments was given in detail. W. Earl Shull, Merrill K. Riley and Charles H. Richardson presented a brief report on the study of the effects of certain toxic gases on the blood of the cockroach, *Periplaneta orientalis* (Linn). R. W. Haegele and Claude Wakeland presented some results on the use of pyrethrum in the control of *Mineola scitulelle* Hulst, a pest of prunes in southwestern Idaho.

The following officers were elected for the ensuing year: *President,* Dr. R. L. Webster; *vice-president,* George L. Reeves; *secretary-treasurer,* H. A. Scullen.

American Meteorological Society

(Report by Charles C. Garrett, secretary for Pullman meeting)

Eighteen papers were presented and two read by title in four sessions on June 16 and 17. On Thursday morning George V. Sager gave a paper on "The Long-term Trend of Rainfall in the Central Sierra Region." In the discussion Edward L. Wells showed a graph of annual rainfall totals in Oregon, beginning with 1850. A paper by Charles C. Conroy on "The Distribution of Early and Late Seasonal Rains in Southern California" was read by Mr. Wells. The effect of a timber canopy on the weather beneath was shown by George M. Jemison. If the forest cover is removed, partially or completely, the average temperature is raised, relative humidity lowered, wind movement increased, evaporation more than doubled and temperature of the surface duff decidedly increased. Other papers by Forest Service officials were presented during the Friday forenoon session. That by W. G. Morris, read by R. E. McArdle, on "The Occurrence and Behavior of Lightning Storms in the National Forests in Oregon and Washington," brought out the fact that 66 per cent. of all lightning fires are caused by wide-spread storms which occur on about four days during each summer. Emphasis should be placed on the prediction and fire-fighting plans for the "general" type of storm day. H. B. Shepard's paper on "Rating Summer Climate for Forest Fire Insurance Purposes" was read by T. T. Munger. It was based on a study of the geographic variation of summer climate as it affects forest-fire hazard, in connection with determining insurance ratings for the Douglas fir region of western Oregon and Washington. T. C. Elliott told of the origin of the name "Chinook," as applied to warm, dry winds. The concluding paper of Thursday morning's program was by C. C. Garrett. Certain climatic anomalies of the Walla Walla Valley consist of relatively high winter mean temperature, due to frequent foehn winds; and low winter sunshine percentage, resulting from the prevalence of valley fog. Other papers bearing on local climatology were by Archer B. Carpenter, on "Fog at Portland, Oregon," and by E. M. Keyser, on "Significance of Weather Abnormalities at Spokane." These were given on Thursday afternoon. Mr. Carpenter had made a detailed study of fog types for two winter seasons, and concluded that while Portland has less fog than cities to the north and south, it has more fog types. Mr. Keyser contrasted some outstanding weather abnormalities at Spokane with those at other points or other seasons, when such conditions are normal. A paper, presented by Jesse W. Smith, Joe R. Fulks and Raymond R. Paul, was read by Mr. Fulks. It was a statistical study of daily minimum temperatures at Winnemucca, Nevada. "Erosion and Runoff Data from Differently Cropped Controlled Plots at the Pacific Northwest Soil Erosion Experiment Station," was the subject of a paper by W. A. Rockie. It is his belief that the now prevalent system of summer fallowing land is, from the erosion standpoint, very bad practice. The results further show that runoff and erosion are largely prevented by any winter vegetative cover except newly seeded winter wheat. O. W. Freeman discussed "The Climate

of the Inland Empire as Related to Geology." His study of fossils, deposits and erosion brought forth evidence of significant changes in climates of past eras, with characteristic flora and fauna. Following this paper, Edwin T. Hodge gave an address on "The Degree of Frigidity in Oregon and Washington during the Pleistocene." He advanced a new theory regarding the climate and the cause for the presence of the larger animals during the era under discussion, *viz.*, relatively high temperature beyond the glacial fringe and abundant precipitation, with consequent dense vegetation.

The morning session on Friday was opened by a paper on "Electric Charges in the Air," by Joseph G. Brown. Near the surface of the earth the air is positively charged all the time, except when it rains or is very dusty. According to theory we would have in a quiet atmosphere a very great excess of positive ions in a surface layer only 20 to 50 meters deep, but we may assume that the circulation of the air will carry this dense positive layer throughout the trophosphere and thus produce the distribution which exists. The daily variation of the space-charge is shown to be related to the daily variation of the wind, and the potential gradient to the convection system. Malcolm Rigby told of recent researches on the aurora, and outlined the work planned by the Weather Bureau in regard to observations of the phenomenon during the international polar year. A paper by C. O. Schick on the feasibility of aircraft flight across the Cascade Mountains of Washington was read by the acting secretary.

A short session was held on Friday afternoon. Edwin H. Jones read a paper on "Identification of Pressure Types." Besides explaining his use of type maps for local minimum temperature forecasting and for estimating winds in the spray-weather forecasts, the author suggests that a system along the line of fingerprint identification might be applied to synoptical charts of large areas. Leland H. Johnson told of "Pressure Gradients as an Index of Nocturnal Winds at Corona, California." An endeavor was made to show by a composite chart on which normal lines of pressure difference and smoothed values of temperature maxima and corresponding minima have been entered that the departure of these lines from the hygrometric formula estimate will show the normal effect of winds upon the final minimum temperature. Papers by James M. Jones, on "Some Outstanding Wet Seasons in California," and by David R. McGinnis, on "The Climate of the Brazilian Plateau," were read by title.

Resolutions were adopted, thanking the faculty and trustees of Washington State College for courtesies extended. It was urged that the work of the Airways Weather Service be given every support and encouragement in analyzing the data collected so abundantly from their numerous observations.

On Friday a get-together luncheon was enjoyed at noon by meteorologists and friends, at which time short talks were given by some who had performed meteorological service, respectively, in Alaska, Porto Rico, Canal Zone and Hawaii.

AMERICAN PHYSICAL SOCIETY, 178TH MEETING

(Report by Leonard B. Loeb, secretary for the Pacific Coast)

The sessions began at 9:30 in the morning of June 17, extended until noon, and were resumed in the afternoon at 2:00 o'clock, terminating at 4:30. The titles of the papers were as follows:

The energy distribution of electrons in field current emission: JOS. E. HENDERSON, R. K. DAHLSTROM, FRANK R. ABBOT, University of Washington.

Mobilities of sodium ions in helium measured in short time intervals: LEONARD B. LOEB, University of California.

Electroscope of high charge sensitivity: E. J. WORKMAN and H. B. DEVORE, California Institute of Technology.

Photoelectric currents in gases between parallel plates as a function of the potential difference: NORRIS E. BRADBURY, University of California.

On the specific heats of ferromagnetic materials: PAUL S. EPSTEIN, California Institute of Technology.

Mobilities of gaseous ions in mixtures of hydrogen and nitromethane and hydrogen and methyl cyanide: ELIZABETH A. HIGLEY and CAROLYN C. THORSEN, University of California.

Determination of the coefficient of ionization by collision using large plate distances and higher pressures: FREDERICK H. SANDERS, University of California.

The distribution of electrons in the photo-effect by Roentgen rays, classically treated: JAKOB KUNZ, University of Illinois.

A theory of the Raman rotation spectra: WILLIAM V. HOUSTON, California Institute of Technology.

Secondary effects in the ionization by hard gamma-rays: E. J. WORKMAN, California Institute of Technology.

Absorption bands in the infra-red spectrum of Venus: W. S. ADAMS, and THEODOR DUNHAM, JR., Mt. Wilson Observatory.

The absolute magnitudes of the O5 to B2 stars determined from the interstellar lines: J. A. PEARCE, Dominion Astrophysical Observatory.

On the temperature of Wolf-Rayet stars and novae: C. S. BEALS, Dominion Astrophysical Observatory.

Further details ascribable to bands of the carbon isotope C_{13} in stars of spectral classes R. and N.: R. F. SANFORD, Mt. Wilson Observatory.

An investigation of the hydrocarbon bands in the solar spectrum: R. S. RICHARDSON, Mt. Wilson Observatory.

The last five papers constitute the contribution of the Astronomical Society of the Pacific to the joint meeting of the Physical Society and the Astronomical Society of the Pacific.

There were twenty-five members of the Physical Society in attendance, covering institutions from San Diego to the University of British Columbia.

It was agreed that the 181st meeting of the American Physical Society would be held on December 16 and 17, 1932, at the California Institute of Technology, Pasadena.

The members of the Physical Society enjoyed a joint luncheon at noon, June 17, and a joint dinner on the evening of June 17, with some twenty-five members in attendance.

In spite of its small size, the meeting was highly successful in the renewal of contacts which it gave between members of the society in the Pacific Northwest and those from other portions of the Pacific area.

American Phytopathological Society, Pacific Division

(*Report by B. A. Rudolph, secretary-treasurer*)

At the sixteenth annual meeting of the society the following officers were elected to serve the society for the next two years: H. E. Morris, *president;* F. P. McWhorter, *vice-president;* B. A. Rudolph, *secretary-treasurer;* J. M. Raeder, *councilor.* Three half-day sessions were held, during which nineteen papers were presented, brief reports of which follow: R. Sprague showed that soil moisture, which is directly correlated with seasonal precipitation, is the determining factor in the relative yearly seriousness of footrot of cereals due to *Cercosporella herpotrichoides* Fron. G. A. Huber discussed the relationship of temperature to the fruit rot of apples occasioned by *Aspergillus sclerotiorum* n. sp. L. K. Jones discussed the means by which the common tobacco virus and latent potato virus reach tomato plants, in which the combination of the two produce "streak." There was also described a quick simple method of inoculating plants with viruses with minimum chance of contamination. The method applies both to fresh and dried material. F. P. McWhorter minutely described symptoms of, also a means of photographing, narcissus mosaic, which is transmitted through the bulbs. He also presented a theory that variegated colors in tulip flowers are the result of the interaction of two viruses, one which intensifies color, one which destroys it. B. F. Dana concluded, from the refractory results of his experiments to transmit the beet curly top disease mechanically to beet, tomato and spinach, that the virus is most active and amenable to transfer soon after infection rather than at any other time. F. P. Mehrlich discussed the physiology and pathogenicity of species of *Phytophthora* which cause pineapple heart-rot. Taxonomic studies and interhost relationships with weeds and green manure plants have been studied. An exhaustive series of trials with fungicides of widely varying formulae showed that Bordeaux 1–0.65–3, used as a dip, afforded very appreciable control. L. Childs found perithecia, presumably of *Mycosphaerella tulasnei,* in pear-twig lesions caused by *Venturia pyrina.* The two fungi discharge their spores at the same time, rendering it difficult to determine the same for the scab fungus alone. W. Carter showed that the mealy bug *Pseudococcus brevipes* (Ckl.) produces two definite wilts in pineapple, one quick, one slow, both probably due to a toxic, variably diffusible secretion of the insect. Two types of leaf spotting results, one chlorotic and the other designated as green spotting. The latter is produced only by certain individuals of the species which are distinguished by a difference in body color. J. R. Kienholz reported on the host relationships and cultural differences of perennial cankers and anthracnose fungi. *Neofalbraea malicorticis* and *Gloeosporium perennans* may be distinguished one from the other by means of certain dyes added in high dilution to culture media. K. F. Baker and F. D. Heald have found that lenticel infection of apples by *Penicillium expansum* (blue mold) is probably responsible for much of the decay heretofore assumed to have been brought about through the means of mechanical injuries. G. Burnett discussed the longevity of the latent and vein-banding viruses of potato in dried leaf tissue. P. Miller reported the successful results obtained with sprays during the past two years for control of walnut bacteriosis. Life history studies of the organism and climatic relationships to the disease have been studied extensively. B. F. Dana and F. P. McWhorter minutely described a serious mosaic disease of horseradish. Turnips and mustard infected by mechanical means developed the disease with symptoms like those on horseradish. G. A. Huber and F. D. Heald have made a careful study of the number and kind of spores drifting in the air of various apple orchards. Similar studies covered the spore load of fruit boxes and gloves. Various processes used to remove arsenical residues reduce the spore load but do not appreciably control storage rots.

American Society of Ichthyologists and Herpetologists, Western Division

(*Report by J. R. Slater, secretary pro tem.*)

At the fourth annual meeting, held on June 17, a short business session was held and the following officers were elected: Dr. B. W. Evermann, California Academy of Science, *president;* Dr. V. M. Tanner, Brigham Young University, *vice-president;* and Dr.

L. E. Griffin, Reed College, Portland, Oregon, *secretary-treasurer.*

Exhibits of living material were as follows: *Eumeces skiltonianus, Uta stansburiana, Sceloporus gracilis, Chrysemys picta belli, Pituophis catenifer heermanii, Thamnophis ordinoides vagrans, Coluber constrictor mormon, Triturus torosus, Ambystoma macrodactylum, Bufo boreas boreas* and *Scaphiopus hammondii* from the northeastern part of Oregon, all by J. S. Brode, Pendleton, Oregon; *Masticophis taeniatus,* by P. H. Pope, Whitman College; *Scaphiopus hammondii* in burrow from central Oregon and Oregon rattlesnake, by Arthur and Ruth Svihla, Washington State College; *Ascaphus truei, Scaphiopus hammondii* (adult and tadpoles), *Rana pretiosa* (Alpine variety from Washington state) and a *Rana* of undetermined species from British Columbia, by J. R. Slater, College of Puget Sound.

Museum specimens of amphibians and reptiles of Walla Walla, prepared by the paraffin infiltration method of Noble and Jaeckle, were exhibited by W. J. Brooking and P. H. Pope, Whitman College, and cleared specimens of *Ascaphus truei* and *Rana pretiosa* by A. Svihla.

The following papers were presented:

Observations on the life history of Ascaphus truei: P. G. PUTNAM, Pullman, Washington (read by L. E. Griffin).

Herpetology of Whitman County, Washington: ARTHUR SVIHLA. Three distinct living conditions exist in this county: pine forests, bunch grass lands and scablands. The amphibians and reptiles, thirteen species in all, found in each were listed.

Nesting habits of the crested blenny, Anoplarchus purpurescens: LEONARD P. SCHULTZ and ALLAN DELACY, University of Washington. The nests of this blenny were found under stones at zero tides on the beach in Lincoln Park, Seattle. Parents are supposed to shape the egg masses by bending their bodies around them. The parents guard the nests.

Ecology and adaptations of the reptiles of sand deserts: W. MOSAUER, University of California at Los Angeles. By slides and motion pictures many features of adaptation of reptiles to the sand conditions were shown.

The Cyprinoid fishes of Lake Lanao, Mindanao, Philippines and their evolution: ALBERT W. HERRE, Stanford University. From his study of the fishes on the islands north and east of Borneo, the author concluded that seventeen species or sub-species which he has described from Mindanao must have developed from the one species *Barbodes binotatus.* It was referred to as a fine problem in evolution for biological study.

Feeding habits and moult of Crotalus confluentus oreganus in captivity: TRACY I. STORER and BERYL M. WILSON, University of California, Davis (read by title).

Notes on some Washington amphibians: JAMES R. SLATER, College of Puget Sound. The known distribution of *Rhyacotriton olympicus* is extended down the coast counties and up the Columbia to within a few miles of Kelso. The distribution of *Plethodon vandykei* was also extended to three new counties in western Washington. The occurrence of pairing of *Rana pretiosa* in the high Cascades was cited. The animals remained in embrace all winter. Eggs of *Scaphiopus hammondii* were hatched and reared in the laboratory. The young were found to be very active and capable of rapid development.

Variation within sub-species: R. R. HUESTIS, University of Oregon. A study in color variation in mice.

Recent avian food habit studies: J. HOOPER BOWLES, Tacoma, Washington (read by title).

Some details of the structure of the ear of Squalus acanthias, S. sucklii and Mustelis canis: LAWRENCE E. GRIFFIN, Reed College. Slides were used to show the difference in the ears of these dogfish.

Sympathetic ganglia of Squalus sucklii: SIDNEY S. MAYER and L. E. GRIFFIN, Reed College. Slides were used to show how this structure differed from any previous description.

Amphibians and reptiles of Umatilla County, Oregon: STANLEY BRODE, Pendleton, Oregon. Twelve species of reptiles and six species of amphibians were listed.

ASTRONOMICAL SOCIETY OF THE PACIFIC

(Report by F. J. Neubauer)

Two forenoon sessions and one joint program with the American Physical Society were given over to the twenty astronomical papers presented. The titles of these and the names of their authors are given in the following list:

The spectroscopic binary boss 2035: F. J. NEUBAUER.

Sun-spots and the weather: SETH B. NICHOLSON.

The galactic rotation effect in open clusters: PHYLLIS HAYFORD.

Wave-lengths in A-type stars: W. E. HARPER.

The green auroral line in the spectra of Novae: PAUL W. MERRILL.

The audibility of the aurorae and their appearance at low atmospheric levels: C. S. BEALS.

The present phase of the solar cycle: SETH B. NICHOLSON and MISS ELIZABETH STERNBERG.

The new ball-bearing support system for the 100-inch mirror at Mount Wilson: F. G. PEASE.

Note on the spectroscopic binary beta Coronae Borealis: F. J. NEUBAUER.

A test of the constancy of magnitudes of the bright stars in Messier 4: F. S. HOGG and HELEN B. SAWYER.

The orbital elements and minimum masses of seven O and B spectroscopic binary stars: J. A. PEARCE.

The dispersion of radial velocity and galactic distribution of variable stars of intermediate and short period: A. H. JOY.

The orbits of four spectroscopic binaries: W. E. HARPER.

On the broadening of lines in stellar spectra: DONALD H. MENZEL.

The clock problem in relativity: J. W. CAMPBELL.

On the afternoon of June 17 a joint program was held with the American Physical Society. Five papers were presented, the titles of which are given elsewhere (*cf.* report of American Physical Society).

BOTANICAL SOCIETY OF AMERICA, PACIFIC DIVISION

(Report by F. D. Heald, secretary)

Two sessions were held for the presentation of papers, the first on the afternoon of June 16, the second on the morning of June 17, with President G. B. Rigg, of the University of Washington, presiding. At the first session nine papers were presented covering the following subjects: Methods of studying kelp colloids, effect of aeration on root and top development of *Pinus contorta,* effect of pH value on fruit oxidase activity, carbohydrate content of the tomato fruit, the significance of transpiration, the Sphagnum bog at Ft. Bragg, California, the relation of chlorophyll content of leaves to catalase activity, the transfer of genes in species hybrids of Triticum and a wheat-rye hybrid formed by adding a rye chromosome pair.

The secretary arranged for the dinner of biologists which was held at 6:00 P. M. in the College Commons. Dr. G. B. Rigg, president of the Botanical Society, Pacific Division, acted as toastmaster. Brief responses were offered by representatives of the participating biological societies, describing in a humorous vein the way in which their particular society had contributed to the present financial depression.

At the second session for the presentation of papers the following subjects were discussed: Some features of the cytology of hybrids; cytotaxonomy of the genus Nicotiana; some factors influencing the penetration of herbicides; some pathologic changes in the anatomy of leaves of the sugar beet affected by the curly top, *Cercosporella herpotrichoides*—a fungus associated with a definite ecological area; the American *Amanita muscaria;* the Agaricaceae of Washington; the influences of certain environmental and physiological factors on the absorption of sulfur by vegetation; the effect of leaf destruction by sulfur dioxide fumigation and corresponding clipping on the yield of alfalfa and grain; and preliminary notes on the petrified forests of central Washington.

Officers were elected for next year as follows: *President,* Dr. E. P. Meinecke, principal pathologist, U. S. Department of Agriculture, Ferry Building, San Francisco, California; *secretary,* Dr. George R. Hill, director, Department of Agricultural Research, American Smelting and Refining Company, Salt Lake City, Utah.

JOINT MEETING OF THE COMMITTEE ON THE OCEANOGRAPHY OF THE PACIFIC AND THE WESTERN SOCIETY OF NATURALISTS

(Report by T. Wayland Vaughan)

A joint meeting of Canadian and United States members of the Committee on Oceanography of the Pacific and the Western Society of Naturalists was held during the afternoon of June 17. Dr. T. Wayland Vaughan presided. Eighteen were present. The University of British Columbia and the Marine Biological Station at Nanaimo, the Oceanographic Laboratories of the University of Washington, the University of Oregon, Stanford University and the Scripps Institution of Oceanography of the University of California were represented. The present activities of the different marine stations along the Pacific Coast were discussed under the topics: Geological investigations, especially studies of marine bottom deposits, dynamical oceanography, chemistry of sea-water and biological investigations. The purpose of the discussion was to see in how far it might be desirable to coordinate programs of research. The discussion led to satisfactory arrangements, especially for investigations in dynamical oceanography and the chemistry of sea-water. At present Scripps is the only institution along the Pacific Coast which has a definite and continuing program for the study of the geological aspects of oceanography. Although biological investigations are prosecuted at all the institutions along the Pacific Coast, it does not now seem practicable to arrange either programs of cooperation or to coordinate the investigations at the different laboratories. The conference was helpful in understanding the problems of the different organizations. The opinion, previously expressed at Eugene, Oregon, in 1930, was reaffirmed that every year there should be such a conference of the representatives of the different institutions engaged in oceanographic work along the Pacific Coast and of others interested in oceanographic research. The opinion was also expressed that the date of the meeting should be set so that it would not conflict with the schedule of summer activities at the Friday Harbor Laboratory of the University of Washington and the Hopkins Marine Station of Stanford University. If the meetings of the Pacific Division of the American Association for the Advancement of Science could be held in September instead of in June, the difficulty mentioned would be obviated.

PACIFIC NORTHWEST BIRD AND MAMMAL SOCIETY

(Report by Leo K. Couch, secretary)

A special program meeting of the society was held on June 16 and 17, 1932, in connection with the an-

nual meeting of the Pacific Division, American Association for the Advancement of Science.

The meeting was called to order by President Hall, who in a few introductory remarks sketched the history of the society. He commented on the *Murrelet*, the Society's triennial publication, and the reputation it has among journals of like standing in the country. He referred to an article recently appearing in SCIENCE by Tracy I. Storer, in which the author refers to the *Murrelet* as a publication of value to students in mammalogy and ornithology.

The following papers were presented:

Recent observation in migratory waterfowl of the interior: WEBSTER H. RANSOM, Spokane, Washington. Several years of drought ending in 1931, caused a chaotic condition to exist in nesting areas of interior United States and Canada frequented by migratory waterfowl. Conditions on the Pacific Coast were not so serious. The author cited hundreds of small lakes, ponds and sloughs that dried up completely in 1930–31. In eastern Washington and northern Idaho his observations showed that drainage projects since 1922 had reclaimed for agricultural purposes 50,000 acres that otherwise were valuable breeding areas for ducks and geese. The inter-mountain country was favored in 1932 with abundant water supply, with the exception of the Great Bear Lake district in Alberta where drought still continues.

A comparative life history study of the deer mouse (Peromyscus): DR. ARTHUR SVIHLA, Pullman, Washington. The author has had an intimate association with various species of *Peromyscus*, working out the life histories under controlled laboratory conditions. Data were presented on mating, parturition, gestation period, number of young, weights to maturity and the correlation between physiological and morphological characters. Mice used were *Peromyscus maniculatus, leucopus* and *truei*, and *Peromyscus californicus* and *eremicus*.

Type locality records of Washington mammals: F. S. HALL, Seattle, Washington. All the literature reviewed in which the now recognized species of Washington mammals were described reveals 65 species and sub-species, of which the type specimens were taken from the State. The list as presented was illustrated by museum skins taken from the Charles R. Connor Museum, State College of Washington.

Importance of bird and mammal enemies of insects in general: R. L. WEBSTER, Pullman, Washington. Personal experiences and research leads the author to the conclusion that the bird and mammal factor in insect control is greatly overrated. The controversy is revived over whether insect species for food are selected according to preference or those which are abundant and easier to take. Dr. Webster leans toward the latter theory. Birds are important factors where insect species are an ebb in abundance, but are almost powerless in general insect plagues. He cited grasshoppers and orchard insects as examples.

Rate of replacement in species: THEODORE H. SCHEFFER, Puyallup, Washington. The author has attempted to set up a "replacement rate" in bird and mammal species, which he defines as the combination of the average size of litters or broods with the number of broods in a season of 12 months. Field studies on *Perognathus lordi* near Lind, Washington, over four seasons showed the average litter size to be 5.16. This multiplied by the number-of-broods factor which he found to be 1.13, gives the "replacement index" as 5.83. Illustrating further with *Peromyscus maniculatus gambeli*, the average litter was found to be 5.3. The number-of-broods factor was 4.08. Multiplying the two gives a replacement rate of 21.62.

Chronological data on elk introductions into Oregon and Washington: LEO K. COUCH, Olympia, Washington. While Rocky Mountain wapiti (*Cervus canadensis canadensis*) were almost unknown in Oregon and Washington in the memory of white man prior to 1911, since then several shipments were made from Montana and Wyoming into the two states, where at the present time these elk are found in the Cascade and Blue Mountain areas. The Olympic wapiti (*Cervus c. occidentalis*) is confined largely to the Olympic Mountains south through Western Oregon to California.

Mammals of Whitman County, Washington: ARTHUR SVIHLA, Pullman, Washington. For the sake of mammal study the upper Sonoran and Transition life zones were divided into the low elevations along the Snake River, the sage brush, and timbered areas. Through collections made for the Connor Museum, Washington State College, 33 mammal species are represented in the county.

Analysis of factors affecting bird and mammal surpluses: IRA N. GABRIELSON, Portland, Oregon. Some factors regulating the rise and fall in faunal numbers are food supply, fecundity, weather conditions, disease, predatory species and old age. Twenty years of personal observation have led the author to believe that food supply and disease are the two greatest factors regulating abundance. Weather conditions and food supply are closely associated, while sudden storms and temperature changes work havoc with many species over short periods.

Following the presentation of papers, Dr. Svihla led the group to his laboratory, where studies were being made on caged *Peromyscus, Perognathus, Dipodomys* and others.

The morning session on the 17th was held jointly with the Western Division, American Society of Ichthyologists and Herpetologists.

The last hour of the afternoon meeting was turned into a round table discussion on birds, to which Professor Slonaker and Messrs. Couch, Gabrielson and Ransom contributed.

SOCIETY OF AMERICAN BACTERIOLOGISTS, EASTERN WASHINGTON-IDAHO BRANCH

(Report by Victor Burke)

During the session on Friday, June 17, sixteen papers were presented. Dr. Rachel Hoffstadt sub-

mitted a communication on the dissociation of *Staphylococcus aureus*. Dissociation resulted in four biochemical types. N. P. Sullivan reported that antiseptic dyes introduced into the intestine destroys the vegetative bacterial cells, nothing but the spores surviving. R. L. Tracy described the lethal effect of alternating current on yeast cells. Dr. John Weinzirl reported that desensitization in tuberculosis with tubercle bacilli killed by chemical or physical agents is unsatisfactory, due to denaturation of the proteins. Complete desensitization was obtained with the protein in Long's SMT. Dr. Victor Burke reported the appearance of agglutinins in rabbits but not in man following vaccination *per os* with *Brucella abortus*. Agglutinins introduced into the stomach failed to appear in the blood stream. In a second paper he presented experimental evidence, suggesting that there is probably a wide interchange of bacteria between land and sea. He also showed tadpoles in the leg stage reared exclusively on a diet of bacteria. Dr. R. E. Stier reported experiments to show that gas bacillus infection may result from massaging the organism into a hypodermic needle wound. Fred Gibson reported that there is no relation between the electric charge and the Gram reaction of the cell. V. A. Cherrington reported that the leucocyte count of milk of cows suffering with mastitis is nearly always more than 100,000 per cc and that the milk of normal cows rarely contains more than that number. Dr. W. V. Halversen reported on a study of the comparative value of various tests for mastitis. The leucocyte count, the catalase test and the bacterial count on blood agar appear to have the most value. Dr. William Levin reported that there exists a fair agreement between the antigenic value of a diphtheria toxoid as determined by the Ramon flocculation test and the guinea-pig method of the National Institute of Health. There was no marked correlation between the degree of immunity conferred on children by various toxoids and their antigenic values as determined by the above tests. Dr. H. J. Sears and Martha Rohner described some variable intestinal organisms and their possible relation to disease. In a second paper they described the characteristics of slow lactose fermenting *B. coli* strains isolated from stools and urine. Neil Black reported that irradiation of mineral oils improves their therapeutic value. G. S. Schilling reported that a correlation exists between the clinical history of sterility and breeding troubles and serological reaction for *Brucella abortus*. C. C. Prouty reported that no correlation exists between production of acid in milk and cream and accumulation of ammonia nitrogen and amine nitrogen.

SOCIETY FOR EXPERIMENTAL BIOLOGY AND MEDICINE, PACIFIC COAST BRANCH

(Report by E. G. Martin)

The Society for Experimental Biology and Medicine, Pacific Coast Branch, met on Friday morning with about 60 in attendance. In the absence of Chairman William Ophuls, Dr. E. G. Martin presided.

Emil Bogen and Russell N. Loomis reported that tobacco tar, which has been alleged by some advertisers of special smoking equipment to be a potential source of mouth cancer, was wholly inactive in producing cancers under conditions in which gas-house tars of recognized carcinogenic action produced cancers invariably. This investigation indicates strongly that whatever may be the cause of smoker's cancer, the tar present in tobacco smoke is not responsible.

C. B. Philip and R. A. Parker have been studying the transmission of Rocky Mountain spotted fever. They have found that uninfected ticks may become infected during copulation with infected ticks. The infection thus transmitted may be imparted to the offspring. Thus sources of infection are maintained from generation to generation of ticks. They showed also that, although the most important source of Rocky Mountain spotted fever infection is *Dermacentor andersoni*, certain other species, notably *D. americani*, may also transmit the infection. Thus the occurrence of Rocky Mountain spotted fever outside the range of *D. andersoni* can be accounted for.

G. E. Davis and R. R. Parker showed that in rabbits, which have been infected with tularemia and have recovered, the reaction between the host and the parasite appears to be affected in such a way that the parasite shows a markedly greater virulence than usual. Some evidence was also obtained indicating that a certain degree of immunity is developed in some cases.

F. M. Baldwin, R. J. Shaw and P. R. Bauman found that the basal metabolism of football players who were participating regularly in intercollegiate contests rose appreciably during the days immediately preceding important games. Similar increases in basal metabolism were not seen in substitutes who did not expect to play. The inference is that the metabolic increase is related to the emotional excitement attending the anticipation of approaching contests.

Agnes Fay Morgan reported the results of studies on the effects of acid, neutral and basic diets on the calcium and phosphorus metabolism of dogs. It was found in general that dogs on an alkaline diet showed better growth and better phosphorus retention than dogs on an acid diet. Dogs on low calcium were more injured by the acid diet than by the alkaline diet.

The combination of low calcium, acid and vitamin D deficiency proved decidedly injurious, particularly to the bones and teeth. It was pointed out that the widely used American dietary of bread, meat and potatoes affords an excellent example of the above combination.

J. M. Luck, Betty Nims and Don G. Willard found an increase in formation of inorganic sulphates in dogs and rats following subcutaneous injection of glycine, alanine, aspartic acid and glutamic acid. They interpret these findings as indicating that amino acids stimulate endogenous metabolism.

Dr. A. B. Stockton showed that in patients suffering from certain types of edema the diuresis induced by sodium bismuth tartrate, although it has a latency of several days, is more prolonged and removes more water than the more prompt diuretics studied. No after-depression of urine flow was seen, nor any adverse after-symptoms. In the latter respect this diuretic is superior to other metallic diuretics examined.

WESTERN SOCIETY OF NATURALISTS

(Report by E. G. Moberg, secretary-treasurer)

A session for the presentation of papers was held on the afternoon of June 16. Under the title "The First Scientific Society in Europe," Mrs. Dorothea W. Singer gave an account of the origin and the early struggles of the *Accademia dei Lincei* in Rome. The different types of oysters grown in the Puget Sound region were shown and briefly described by Trevor Kincaid, who gave a paper dealing mainly with the introduction and methods and extent of culture of the Japanese oyster in Washington. A paper by H. W. Graham and E. G. Moberg discussed the distribution of plant nutrients, particularly phosphate, in the water of the Pacific. The paper was based chiefly on data obtained by the yacht *Carnegie*. Data comparing the efficiency of raw, evaporated and powdered whole milk in promoting growth and regenerating haemoglobin in the rat were presented in a paper by Alice M. Bahrs and C. U. Moore. From feeding experiments on planarian worms Marian Pettibone had found that not only do different types of tissues differ markedly in their power to promote growth, but that tissues from mature and embryonic animals also differ. Rosalind Wulzen showed that the growth-promoting properties of tissues depend upon the extent to which the tissue is subdivided.

The society also sponsored jointly with the Committee on the Oceanography of the Pacific a luncheon meeting, at which a number of phases of oceanographic research in progress on the Pacific Coast were discussed.

WESTERN SOCIETY OF SOIL SCIENCE

(Report by G. Orien Baker, secretary pro tem.)

Two half-day sessions of the society were held at the State College of Washington and two half-day sessions were held at the University of Idaho. The average attendance was twenty-five members.

Dean E. C. Johnson gave a brief address at the first session in which he emphasized the importance of soil research and pointed out the interest of the public of the State of Washington in soil problems. He mentioned the fact that a state advisory council on soils and soil fertility is functioning in this state for the purpose of formulating a state-wide program of soil investigation and of providing financial means to carry out the program.

Lloyd D. Doneen reported on a study of the absorption of nitrogen at different stages of growth for different varieties of wheat. He found the greatest yield was obtained by application of nitrogen fertilizers at the time the wheat was beginning to shoot and that the wheat plant, in certain treatments, contained considerably more total nitrogen at the heading stage than it did when it was ripe.

W. L. Powers reported on the characteristics of forest soils of the Pacific Northwest in which he considered the different profiles, base exchange, colloids and microbial population of several different soils from various sections of Oregon.

W. A. Rockie reported on erosion and runoff as measured from differently cropped control plots in which he showed that runoff and erosion are largely prevented by any winter vegetative cover except newly seeded winter wheat, while fallow lands seeded to winter wheat suffer enormous losses of both rainfall and soil.

N. E. Edlefsen reported on a new method of determining vapor pressure of soils which requires less time than the methods previously used.

The afternoon session was devoted; first, to visiting the Pacific Northwest Soil Erosion Station, where the various investigations in progress were explained; second, to an examination of a profile of a virgin Palouse soil; and third, to a study of the topography of the land near the breaks of the Snake River.

President Neale gave a brief address at the first session at the University of Idaho. He illustrated how the virgin soils in the United States have been depleted gradually from East to West by migrating farmers and pointed out the importance of research in soils and the necessity of making new information available to the farmer.

G. O. Baker discussed the effects of the activity of microorganisms on the composition of organic resi-

dues in two different soils and showed that there was a pronounced effect of different soils and only a slight effect of different organic materials on the sequence of activity, if the nitrogen content of the organic materials was made up to the same percentage.

Robert A. Greene reported that the Azotobacter (plaque) method of determining the fertility requirements is not applicable to any extent to Arizona soils.

O. Lilliland reported that the scorching of prune trees in the Sacramento Valley of California is associated with the potassium content of the soil. He also found the Neubauer seedling test to be a good criterion of the available potassium supply of the soil.

W. V. Halverson and R. E. Bell reported that after modifying the soil plaque method of Sackett, the results obtained show with few exception that where phosphate fertilization in the field resulted in significant increases in yield, the method showed an acute phosphorus deficiency.

Philip Isaak and R. E. Bell reported that if soils are high in acid-soluble phosphorus (above 800 pounds per acre), low in $CaCO_3$, and the pH of the acid extract is low, they do not respond to phosphorus application, but if the soils are low in acid-soluble phosphorus, high in $CaCO_3$ content, and the pH of the acid extract is high, they will respond to phosphate fertilization.

R. E. Bell discussed the rotation plots of the University of Idaho and stated that the wheat-oats-potato rotation maintained a higher level of soil organic matter than was obtained by any of the other cropping systems except where manure is applied.

G. B. McDole reported that in Idaho deep tillage done properly is giving beneficial results on soils of the texture of silt loam or heavier.

F. B. Laney discussed the geology of the Palouse region and stated that the present surface soil was brought in by the wind, but that the present topography is a result of erosion.

OBITUARY

ERNEST JULIUS WILCZYNSKI

ERNEST JULIUS WILCZYNSKI, professor emeritus in the department of mathematics at the University of Chicago, died on September 14 in Denver, Colorado, after a lingering illness of more than nine years.

In his youth he was a precocious student of mathematics. He was born in Hamburg, Germany, on November 13, 1876, but his family migrated to America when he was still quite young and settled in Chicago, where he completed his elementary and high-school education. At the age of seventeen, with the assistance of an uncle, Ellis Wilczynski, of Hamburg, he returned to Germany and studied at the University of Berlin, where he received the degree of doctor of philosophy in 1887 at the age of twenty-one.

He was very young and boyish in appearance when he came back to the United States after receiving his degree and was at first unable to secure a teaching position. His first year he spent as a computer in the office of the *Nautical Almanac* at Washington. In 1898, however, he was appointed instructor of mathematics at the University of California, and from that time to his retirement from active work in 1923 on account of illness he was a leader in mathematical research and university mathematical instruction. . At California, he served as assistant and associate professor until 1907, with an interruption from 1903 to 1905, when he was in Europe as a research associate of the Carnegie Institution of Washington. He was associate professor at the University of Illinois from 1907 to 1910, and at the University of Chicago from 1910 to 1914, and professor of mathematics at Chicago from 1914 to 1926. He was made professor emeritus in 1926 when it seemed clear after three years of illness that he would never be able to return to active work. It was characteristic of his courage and his optimism that he never gave up hope of doing so.

Wilczynski's mathematical curiosity led him into varied fields. In his earlier years he wrote on astronomy and applied mathematics and differential equations. At the same time he was beginning the work in projective differential geometry which later became his principal interest and the one for which he is best known to mathematicians in this country and abroad. His methods in this domain showed great originality and power and have been widely developed by his students and other writers. He wrote also on the theory of functions of a complex variable, and seventeen of his seventy-seven published papers are distributed in miscellaneous fields different from those already mentioned.

In mathematical affairs other than teaching and research Wilczynski's career was also a notable one. He was at various times councilor and vice-president of the American Mathematical Society, and of the Mathematical Association of America. He was a lecturer at the New Haven Colloquium of the society in 1906, and associate editor of its *Transactions*. In 1909 he won a prize of the Royal Belgian Academy of Sciences, and in 1919 he was elected a member of the National Academy of Sciences at Washington.

Professor Wilczynski is survived by his wife, whom he married in Italy in 1906, and three daughters. His legacy to American mathematicians is a great one. The theory of projective differential geometry, as he formulated it, is largely the creation of his own mind. His publications in this and other fields have been an active inspiration to many research workers. His students are distributed widely in mathematical work throughout the country. They and his older colleagues will mourn the loss of his personality, but will cherish and preserve the devoted interest in mathematics which was his dominant characteristic.

G. A. BLISS

THE UNIVERSITY OF CHICAGO

BARTON WARREN EVERMANN

BARTON WARREN EVERMANN was born in Monroe County, Iowa, on October 24, 1853, and died at his home, 2715 Woolsey Street, Berkeley, California, at 4 P. M. on September 27, 1932. In his seventy-eight years and eleven months there was crowded a long succession of events and accomplishments, the tenth part of which many men would consider ample. Driven always by an incessant desire to add to the store of human knowledge and to teach this knowledge to others, he was a very busy man up almost to the day of his death.

His final illness came on somewhat gradually. On June 21, 1932, he very reluctantly entered Stanford University Hospital in San Francisco, in the hope that a few days of rest and relaxation would prove beneficial. But the time had evidently come for a general disintegration of bodily functions because one complication led to another until he was soon so deeply enmeshed that no hope of escape could be seen. In spite of this, his indomitable will to overcome obstacles kept him fighting for life to the last. His last conscious moments were given to pleading with those about him to let him get up and go to the academy where he had important work to do.

He married Meade Hawkins, of Burlington, Indiana, on October 24, 1875; she died at Berkeley, California, on February 9, 1929. A son and a daughter, Toxaway Bronte and Edith (Mrs. William E. Humphrey), survive.

Educated in the schools of Indiana, he always looked upon the affairs of that state with great personal interest. He graduated from the state university in the class of 1886 and received the degree of doctor of philosophy in 1891.

His first work was as a teacher in the public schools of Indiana and California, and although he continued with this duty only ten years it made a lasting impression upon his mind. At heart he was always a teacher and he had the greatest admiration for any one, young or old, who had a desire to acquire information. Also he was very intolerant of those who considered they had learned enough. It seemed to most of us who knew him intimately that his happiest moments were those spent telling of natural history to classes of school children which visited the halls of the California Academy of Sciences.

The many honors which came to the man are enumerated in well-known books of reference and it will suffice here to say that throughout his career he was intimately associated with the great naturalist, David Starr Jordan. Together they traveled, studied and explored, and together they wrote many of the most important works on fishes which have been published. Some of these were: "The Fishes of North and Middle America," 4 vols., 1896, 1900; "American Food and Game Fishes," 1902, several editions; "Check List of the Fishes of North and Middle America," 1930, etc.

In 1886 he first became associated with the U. S. Bureau of Fisheries, where he occupied several official positions. From 1903 to 1910 he was in charge of the Division of Scientific Inquiry, and from 1910 to 1914 he had charge of the administration of the Alaska Fisheries Service. The Pribilof Islands were particularly interesting to him, from the time he first became a member of the Fur Seal Commission in 1892 and visited Bering Sea, until his death.

The amount of work which he did in ichthyology is astonishing and his activities in this line extended from Porto Rico to the south seas. Next in importance of interest to the fishes to him were the birds, about which he wrote extensively.

He kept up to date a card index of his publications and the last number is 387; this is a review of W. S. Blatchley's book, "My Nature Nook," which appeared in SCIENCE, Vol. 76, No. 1959, July 15, 1932, pp. 57–58.

His notice of the death of Dr. Jordan was published in SCIENCE (Vol. 74, No. 1918, October 2, 1931, pp. 327–328) and has attracted wide attention. (See O. F. Cook, "The Need of Naturalists." *Journal of Heredity,* Vol. 23, No. 6, June, 1932, pp. 239–243.)

Dr. Evermann came to the California Academy of Sciences in 1914 as director and became responsible for some of the most important developments in the history of the institution. The installation of the long series of habitat groups in the exhibition halls was immediately begun under his supervision and was carried to completion. In 1921 he became instrumental in the establishment of the Steinhart Aquarium in San Francisco under the auspices of the academy; this was through his acquaintance with Mr. Ignatz Steinhart. In 1929 arrangements were made with Mr. Leslie Simson for the collection of a series of African mammals

and at the present time these are being installed in a series of habitat groups in a building, recently completed. During his régime at the academy there were published twenty-five volumes of scientific reports. Expeditions were sent far and wide; to the Gulf of California, Pacific Islands, Galapagos Islands, South America, Australia, Alaska, British Columbia, Hawaii, and many places in the United States and Mexico. His interest in such activity was very great and the enthusiasm with which he greeted the younger members of the staff on their return was most encouraging. One of his last acts, dictated from a hospital cot, was the preparation of a skeleton outline for the publication of a series of comprehensive reports upon the results of the Templeton Crocker Expedition of the academy in 1932.

He established the department of fishes in the academy and secured for a nucleus the great collection of South American forms from Indiana University; this is estimated to contain more than 100,000 specimens.

He left plans for several projects but practically no unfinished work. One important manuscript dealing with fishes of west Mexican waters is completed and awaiting publication and the same is true of his annual report of the academy and aquarium for 1931. Otherwise his work was done.

G. DALLAS HANNA

SCIENTIFIC EVENTS

THE PAINTED DESERT AND THE PETRIFIED FOREST NATIONAL MONUMENT

THE "Painted Desert" area, which includes some colorful "bad lands" and a Black Forest of petrified wood, was added to the Petrified Forest National Monument in Arizona when President Hoover signed a proclamation on September 23, according to an announcement made by the Department of the Interior.

The proclamation concerns approximately 53,300 acres, of which 23,832 acres were already government owned land and approximately 29,468 acres were privately owned. The territory added is a few miles north of the present monument and a strip a mile wide connects the two areas. The newly-constructed bridge over the Rio Puerco, which was dedicated in July, makes this area easily accessible to visitors from the Petrified Forest.

The addition of the "Painted Desert" to the Petrified Forest Monument makes of this a unique reservation, beginning with colorful marl dunes, spotted with great black petrified trees—some perhaps lying where they fell with stumps and roots undisturbed—then proceeding south over a level cactus and sage-dotted plain, crossing the Santa Fé Trail, and ending in another petrified forest region, where giant trees that were carried in millions of years ago by flood waters gleam in the sunlight. The "Painted Desert" region was first discovered by Coronado in 1540, and was named by him "El Pintado Desierto."

The memorandum from the Department of the Interior says: "Great scientific interest lies in this region because of the nature of the trees which have been fossilized in the Black Forest. They belong to a different age and are a different variety from those in the petrified forest region previously included in the monument. Stratified sections of cliffs and buttes show many contrasting colors, which, combined with the striking hues of the soil surfaces, make it a gorgeous spectacle, presenting in form, color and grouping of topographical features a surprising and fascinating variety. This region is one of the most spectacular bits of color in the entire Southwest. The fantastic formations, together with the shifting lights and shadows which vary the colorings from the most delicate lavender to deepest purple, and run the gamut of the various shades of red, green, brown, orange and blue, present an ever-changing picture of breath-taking beauty."

THE MELLON INSTITUTE TECHNOCHEMICAL LECTURES

Two series of lectures on subjects in industrial chemistry and chemical engineering will be presented by technologic specialists of the Mellon Institute of Industrial Research from October 3 to December 12, 1932, and from January 9 to May 22, 1933. The lectures will be open to all students of industrial chemistry and chemical engineering in the University of Pittsburgh, as well as to the institute's members. The program is as follows:

Introductory Lecture

Dr. E. R. Weidlein: "The Status and Work of the Chemical Engineer."

First Series: Lectures on Some Basically Important Chemical Engineering Materials, their Production, Properties, Uses and Evaluation

Mr. O. O. Malleis: "Solid Fuels."

Mr. E. B. Read: "The Manufacture of Refractories."

Mr. S. M. Phelps: "The Properties and Uses of Refractories."

Mr. Tracy Bartholomew: "The Manufacture, Properties and Uses of Portland Cement."

Dr. A. P. Thompson: "Electric Furnace Products."

Dr. S. A. Braley: "Steel and Its Treatment."

Dr. A. W. Coffman: "Corrosion-Resistant Materials."

Dr. W. W. Duecker: "Sulfur."

Dr. W. B. Burnett: "Rubber."
Mr. Foster Robertson: "Synthetic Resins."

Second Series: Lectures on Professional Opportunities in Various Industries—What the Chemist and Chemical Engineer Have Done, Are Doing, and Can Probably Accomplish in These Fields

Dr. H. E. Foote: "Industrial Gases."
Mr. E. J. Casselman: "Glass."
Dr. H. A. Ambrose: "Petroleum Production."
Dr. D. R. Stevens: "Petroleum Refining."
Dr. E. W. Reid: "Solvents."
Dr. P. B. Davidson: "Paper."
Mr. C. F. Goldthwait: "Textiles."
Dr. R. N. Wenzel: "Fatty Oils and Soaps."
Dr. T. M. Andrews: "Cottonseed Products."
Dr. G. J. Cox: "Sugar."
Dr. M. W. Mead: "Zymochemistry."
Mr. E. R. Harding: "Foods."
Dr. H. K. Salzberg: "Dairy Products."
Dr. R. F. Beard: "Carbonated Beverages."
Dr. J. J. Enright: "Bacteriology, Chemistry and Public Health."
Dr. G. D. Beal: "Pharmaceuticals."
Dr. L. H. Cretcher: "Synthetic Medicinals."

W. A. HAMOR,
Assistant Director

SEPTEMBER 21, 1932

A COURSE IN ANIMAL SOCIOLOGY AT HARVARD UNIVERSITY

A NEW course at Harvard University, tracing the development of animal sociology from fish and insect groups to modern human societies, has been announced. The first course of its type to be given at the university, it covers the wide field of social behavior in every range of the animal kingdom.

The course has been arranged by the Department of Sociology, and will be conducted under the direction of Dr. Pitirim A. Sorokin, professor of sociology, and Professor William Morton Wheeler, professor of entomology, and associate curator of insects at the Museum of Comparative Zoology. Lectures will also be given by a distinguished group of specialists who have recently completed important investigations on the subject of animal sociology.

The object of the new course is to acquaint students with the wide range of social and collective behavior in the animal kingdom, and to examine the more significant types of this behavior. The large amount of recent investigation of the communal behavior of insects, birds and especially of the monkeys and anthropoids has yielded results of much theoretical interest to the student of anthropology and human sociology. Owing to the vast extent of the field, the lectures in the course have been apportioned among several specialists. Dr. Roderick Macdonald will present the material on aggregations in the lower invertebrates and fishes, and Dr. Wheeler on the aggregations and communities of insects. Accounts of the family life of amphibia and reptiles will be presented by Mr. Arthur Loveridge. Flocks of birds and herds of lower mammals will be treated by Dr. Glover M. Allen, and the primitive communities of monkeys and apes by Dr. Earnest A. Hooton and Mr. H. J. Coolidge, Jr. A final lecture, comparing human and animal sociology, will be given by Professor Sorokin.

A considerable amount of illustrative material for the lectures has been accumulated. The Harvard Film Foundation has collected films to illustrate the social life of insects, birds and other forms of animal life. Also, by special arrangement and through the courtesy of Mr. Martin Johnson, some of his recent animal and ape films have been loaned for use in the course.

THE CENTURY OF PROGRESS EXPOSITION AND THE AMERICAN CERAMIC SOCIETY

THE American Ceramic Society will join the engineering societies of America in a week's program which the authorities of the Century of Progress Exposition have designated as "Engineers' Week." The proposed program has two objectives: (1) to provide arrangements so that the visiting engineers may see the exhibits of special interest to them under favorable circumstances, and (2) to provide means for bringing before ceramists, and thus before the public, through addresses and demonstrations, some of the contributions of ceramics to man's progress.

On Wednesday, June 28, 1933, the several societies will have a joint program tentatively arranged as follows: Members will meet at 9:30 A. M., in a suitable locality, such as the court of the Hall of Science, to receive the coat lapel decoration (to identify the delegates throughout the day) and to form in groups to be taken to the various exhibits as selected; a description of the exhibits to be visited will either be available at this point or will have been received by the members earlier. A suitable number of properly qualified guides will be on hand to take the groups to the points desired.

Each of the exhibits to be visited will put on special programs relating to the exhibitor's work. It is suggested that at the exhibits, in addition to any machinery or equipment demonstration the exhibitor may put on, the officials and scientific men whose work relates to the subject of the exhibit be present and perhaps make brief addresses.

At 12:30 there will be luncheon at the place or places which will later be determined when the restaurant plans are fully developed by the exposition. Afterwards short speeches and science demonstrations are proposed. At 2:30 or 3:00 o'clock trips to the

exhibits will be resumed. At. 7:00 P. M., there will be a banquet at the Stevens Hotel. It is hoped that among the guests at the banquet there will be distinguished engineers from abroad. For those who may not be able to attend the banquet (the hotel seating capacity is about 2,400) a special lighting display may be provided at the exposition grounds.

The week of June 25 at the exposition is to be made notable by the fact that the American Association for the Advancement of Science will begin its annual meeting on Monday, June 19, continuing through to Friday, June 30. Fifty distinguished scientific men from other countries have received special invitations to participate in this meeting.

The American Ceramic Society has definitely scheduled its 1933 summer meeting at the Century of Progress Exposition during the week of June 25, participating in the engineers' banquet with suitable joint programs with the several engineering societies, as well as with the American Association for the Advancement of Science.

The personnel of the local committee on arrangements for the American Ceramic Society is: R. A. Beverly (chairman), 3754 N. Central Park Ave., Chicago; Dr. L. I. Shaw, Western Electric Company, Department 7434, Hawthorne Station; F. L. Steinhoff, editor, *Brick and Clay Record,* 59 E. Van Buren Street; H. V. Kaeppel, editor, Industrial Publications, Inc., 59 E. Van Buren Street; D. F. Albery, Northwestern Terra Cotta Company, 2525 Clybourn Ave., and W. C. Lindemann, A. J. Lindemann and Hoverson Company, Milwaukee, Wisconsin.

SCIENTIFIC NOTES AND NEWS

PROFESSOR ALBERT EINSTEIN will deliver the Herbert Spencer lecture at the University of Oxford in 1933.

THE International Congress of Physiology at its recent meeting in Rome decided to hold the next congress in Moscow, when Professor Ivan Pavlov will doubtless be president.

DR. WALTER B. CANNON, George Higginson professor of physiology at the Harvard Medical School, has been elected an honorary member of the Barcelona Academy of Medicine.

DR. ALOIS F. KOVARIK, professor of physics at Yale University, was the recipient on July 2 of an honorary doctorate of science from Charles University in Prague, and on June 10 of the Memorial Medal from Comenius University in Bratislava. He gave lectures in May and June at these universities and at Brno. During his sabbatical leave he also visited many of the physical laboratories and radium institutes in Europe.

AT the forty-eighth meeting of the American Astronomical Society held in Cambridge, Massachusetts, on September 2, the following officers were elected: *Vice-president,* Benjamin Boss; *Secretary,* R. S. Dugan; *Treasurer,* F. C. Jordan; *Councilors,* F. R. Moulton, Harriet W. Bigelow, D. W. Morehouse and Otto Struve; *Member of the Division of Physical Sciences, National Research Council,* J. A. Miller. The next meeting of the society will be held at Atlantic City, from December 27 to 29, in affiliation with the American Association for the Advancement of Science.

DR. JENNINGS C. LITZENBERG, Minneapolis, was elected president of the American Association of Obstetricians, Gynecologists and Abdominal Surgeons at its recent annual meeting in French Lick, Indiana.

DR. SHIRLEY W. WYNNE, health commissioner of New York, will celebrate, October 8, the twenty-fifth anniversary of his association with the city department of health. He was appointed assistant to the commissioner in 1920 after having spent thirteen years as medical inspector, assistant registrar and chief of the division of statistical research. He became deputy commissioner in 1926 and commissioner in 1928, succeeding Dr. Louis I. Harris.

DR. MARTIN FROBISHER, JR., has been appointed associate in epidemiology at the Johns Hopkins School of Hygiene and Public Health. He resigned as associate in pathology and bacteriology at the Johns Hopkins University in 1928 to join the Rockefeller Institute for Medical Research in New York. The last three years have been spent in Brazil, where he has been engaged in research on yellow fever for the International Health Division of the Rockefeller Foundation. Dr. Frobisher recently recovered from an attack of yellow fever.

PROFESSOR GEORGE F. ECKHARD, who has been professor of structural engineering at the University of Vermont and the State Agricultural College since 1915, has been appointed dean of the College of Engineering to succeed the late Josiah W. Votey, who died last year. Professor Eckhard was appointed acting dean at the time of Dean Votey's death.

DR. O. J. FARRELL has been appointed professor of mathematics at Union College.

DR. T. D. BECKWITH has been appointed associate professor of bacteriology at the University of California at Los Angeles.

DR. OTIS M. COPE has resigned as associate professor of physiology and pharmacology at the University of Nebraska College of Medicine, to accept the professorship of physiology and physiological chemistry at the New York Homeopathic Medical College and Flower Hospital.

W. F. MCCORMICK, who received the doctorate of philosophy in chemistry from Pennsylvania State College in June, has been appointed head of the department of chemistry at the Mississippi State College for Women, Columbus, Mississippi.

DR. DOROTHEA H. SCOVILLE, formerly resident physician at Vassar College, and Dr. Margaret Kelly, formerly a member of the faculty, have joined the staff of Connecticut College, Dr. Scoville as resident physician and Dr. Kelly as associate professor of chemistry.

DR. W. W. FLEXNER has been promoted to be associate in mathematics at Bryn Mawr College.

HENRY IVES BALDWIN, formerly in charge of forest investigations for the Brown Company, Berlin, New Hampshire, will spend the academic year 1932–1933 teaching silviculture in the department of forestry at the Pennsylvania State College, substituting for Assistant Professor H. J. Lutz, who is studying for the Ph.D. degree at Yale University.

DR. ROBERT A. MILLIKAN, director of the Norman Bridge Laboratory of the California Institute of Technology, has returned to Pasadena after spending some weeks in obtaining records of the intensity of cosmic rays at various latitudes and altitudes.

DR. ROBERT J. TRUMPLER, of Lick Observatory of the University of California, has returned after a year in Europe. He spent the greater part of the time at the University of Zurich, engaged in astronomical research. In addition, he visited observatories and laboratories in Germany, Holland and England and represented the University of California at the celebration of the three hundredth anniversary of the founding of the University of Amsterdam.

DR. C. E. MCCLUNG, professor of zoology and director of the laboratory of zoology at the University of Pennsylvania, spent several weeks in August as the guest of the laboratory of biology at the University of Colorado.

DR. SAUL B. ARENSON, associate professor of chemistry in the University of Cincinnati, has recently returned from a sabbatical leave spent in the Orient and the Tropics.

DEAN F. G. MILLER, of the School of Forestry of the University of Idaho, has spent a leave of absence in study and travel in Europe. He worked at the Dresden Technological Institute, specializing in forest management and forest economics.

DR. JOSEPH EASTMAN SHEEHAN, of New York, recently sailed for Istanbul, Turkey, at the invitation of the government, to establish a unit for treatment by plastic surgery of soldiers wounded in the World War.

FRANCISCO DE SANTOS HALL, assistant professor of forestry in the University of Lisbon, who has been spending a year's leave studying American forestry, left Washington on September 15 to resume his work at Lisbon.

A. SCHMID, professor of animal breeding in the Swiss Federal Institute of Technology, at Zurich, after attending the International Congress of Genetics at Ithaca, visited Davis, California, to make a study of the organization and work of the animal husbandry division of the College of Agriculture of the University of California.

THE seventeenth annual meeting of the Optical Society of America will be held at the Lake Placid Club, Essex County, New York, from October 13 to 15. There will be a series of contributed papers on the morning and afternoon of Thursday, October 13, and in the evening a lecture on "The Early History of Optics" by Dr. K. K. Darrow, of the Bell Telephone Laboratories. On Friday, October 14, arrangements for conference groups have been made. In the afternoon there will be invited papers on "A Century of Optics." These include "Sidelights on the Era of Young and Fresnel" by Professor E. L. Nichols, Cornell University, "The Electromagnetic Theory" by Dr. W. F. G. Swann, Bartol Research Foundation, and "The Modern Theory of Light" by Professor E. U. Condon, Princeton University. On Saturday morning, October 15, there will be invited papers on "Scattering of Light by Supersonic Waves," with experimental demonstration, by Professor P. Debye, of the University of Leipzig, and Professor F. W. Sears, of the Massachusetts Institute of Technology, followed by group conferences which will be continued in the afternoon.

METALLURGISTS will meet in Pittsburgh on October 28, to hear reports on studies in steel research undertaken at the Carnegie Institute of Technology. The occasion is the sixth annual open meeting of the metallurgical advisory board to that institution. The morning session will be devoted to reports on studies made by the bureau of metallurgical research on the alloys of iron, manganese and carbon. The afternoon session will be devoted to the work of Dr. C. H. Herty, Jr., and his assistants who are working under the auspices of the metallurgical advisory board. His first report will be on "The Deoxidation of Steel with

Manganese, Aluminium, Silicon Alloys." In his second report he will be assisted by C. F. Christopher. The subject will be "The Use of Manganese, Silicon Alloys in Open Hearth Process." The final report with M. W. Lightner will be on "The Effect of Deoxidation and Furnace Manipulation on Some Physical Properties of Open Hearth Steel." A business session and a dinner, at which Dr. Thomas S. Baker, president of the Carnegie Institute of Technology, will preside, will be held in the evening at the Hotel Schenley.

THE following resolution dissolving the Association to Aid Scientific Research by Women was approved at a recent meeting: *Whereas,* the objects for which this association has worked for thirty-five years have now been achieved, since women are given opportunities to engage in scientific research on an equality with men, and to gain recognition for their achievements, be it *Resolved,* that this association cease to exist after the adjournment of this meeting.

The Official Record of the U. S. Department of Agriculture reports that Secretary Hyde has revoked the domestic European corn-borer quarantine and regulations on all federal restrictions on interstate shipments under that quarantine have been cancelled. Secretary Hyde states that the reason for the revocation is the failure to obtain funds sufficient to maintain effective control. The department's estimate as to the needs for this work during this fiscal year was $795,000, a decrease of $155,000 from the last year's appropriation. The sum of $295,000, which has been appropriated, is inadequate to prevent the shipment or trucking of corn from the infested areas and to carry out the other measures essential for the protection of uninfested districts, and the department therefore has no choice but to cancel the regulations. Revocation of federal regulations will give uninfested states an opportunity to issue such orders as they may feel necessary for protection against the introduction of infestation. The appropriation will enable the department to continue scouting to determine the limits of distribution of the borer. States outside the infested area will thus be able to keep informed as to the areas to which any state restrictions should apply and infested states will know the territory in which suppressive measures are needed.

THE Shenandoah National Forest, which is in Virginia and West Virginia about 100 miles southwest of the nation's capital, has been renamed the George Washington National Forest by executive order of President Hoover. Secretary Hyde upon recommendation of R. Y. Stuart, chief of the Forest Service, chose this forest as the most fitting national forest to be named after Washington. This forest is in a region frequently traversed and in part surveyed by Washington. The George Washington National Forest is the largest in Virginia. It stretches for nearly 100 miles along the summit and slopes of the Shenandoah Mountains and for a shorter distance along the Massanutten Range. Its gross area is 802,700 acres, more than half of which has already been acquired by the government. The land now supports extensive stands of growing and mature timber. It has great value for watershed protection and recreational purposes. Numerous cities and towns draw their water supplies from its area and it constitutes an important part of the drainage area of the Shenandoah and Potomac Rivers. The forest's camping and outing facilities are being developed. This is the second national forest to be named for a president of the United States this year. The Colorado National Forest was recently renamed the Roosevelt. Other national forests named for presidents are the Lincoln in New Mexico and the Cleveland in California.

FOR a number of years, according to the Paris correspondent of the *Journal* of the American Medical Association, the lack of space for the growing needs of the laboratories and the constant increase in the number of students at the faculty of medicine at Paris has made a change of site more and more imperative. The Rockefeller Foundation donated, some time ago, 150,000,000 francs ($6,000,000) for the purpose, on condition that the central government would contribute an equal sum. All that remained to do was to decide on the new site, which would have to be large and yet not too far distant from the residential sections of Paris, to take account of the needs of the professors and their pupils. That is a double requirement difficult to realize. A preliminary meeting was recently held at the ministry of public instruction, under the chairmanship of the minister himself, which was attended by Professor Balthazard, dean of the faculty of medicine; Professor Roussy, his assistant; Mr. Carléty, rector of the University of Paris; Mr. Cavalier, director of higher education, and representatives of other ministries. The choice fell on a tract of land (formerly used for military purposes) bordering on the southern line of the old fortifications, which is a long distance from the center of Paris. The plan was long discussed, but unfortunately, according to the correspondent, rejected to locate the new faculty of medicine on the site of the present Halle aux vins, which, in that case, would have been transported outside of Paris. This site would have been better for the university buildings. Situated on the bank of the Seine, alongside the Institut médico-légal, it would not have been too far from the other faculties where are installed the publishers of medical works, the shops of the manufacturers of instruments

and the rooming houses for students. The selection of the more distant site will mean a loss to the interests mentioned.

THE Navy Department has announced the publication of the new hydrographic chart of Cuba, marking the completion of a twenty-five-year naval survey which has made available accurate information of Cuban waters for the benefit of merchant ships and naval vessels. To obtain the data for this work, 2,300 miles of shore line have been surveyed and 23,429 square nautical miles of soundings have been made. During this field work one general chart, twenty-one coastal charts and fifty-six harbor or plan charts have been evolved, all of them hydrographically and geodetically accurate. While the work progressed 634 editions of the various charts have been produced, incorporating changes and additions as the data became available from the field parties. With the exception of the years 1917 to 1921, the Navy has had one and, part of the time, two naval survey vessels engaged in this work during the season when it could be expeditiously employed. During the last few years, since the development of aviation and with the assistance of aerial photography, much more topographic detail was obtained. Mangrove-covered shores and cays which were almost inaccessible by boat were accurately charted. More than 1,265 miles of the main coast line of Cuba and the Isle de Pines have been flown, photographed and charted by naval planes.

AN account of variations in the standards of electrical resistance established by the British Association Electrical Standards Committee in 1865 was given by Sir Richard T. Glazebrook and Mr. L. Hartshorn in a paper read in the Mathematics Section at the York meeting. This traced the history of the variations known to have occurred in the standard coils and discussed the results up to date. The records, it was noted, showed that most of the coils had changed appreciably during their long life, but that two of the platinum coils of pure metal originally made in 1867 had remained unchanged. Between 1880 and 1888 the value of the British Association unit as expressed in terms of mercury remained unaltered. Down to 1908, allowing for recorded alterations in the coils, the value assumed for the British Association unit was satisfactorily known. The point of most importance which emerged from Sir Frank Smith's measurements in that year was the permanence of the platinum coils. This had continued, and according to Mr. Hartshorn's observations in 1932 the values observed for the minute difference between them had lain between 0.00059 and 0.00063 British Association units.

DISCUSSION

THE SHOVELNOSED STURGEON IN THE ARKANSAS RIVER

ON November 20, 1931, I visited Mr. J. R. Alexander on his plantation near Scott, Arkansas, about 20 miles below Little Rock, and about two miles from the Arkansas River. While there, Mr. Bruce Crump presented me with some fragments of fish armor of a very unusual kind, but evidently from a sturgeon. The fisherman, Mr. T. C. Hamilton, who had caught it, said that the fish was called a "sand sturgeon." Later, Mr. Crump obtained from the same fisherman and sent me the head and major part of the skin of such a fish (the tail part only being lacking). This fragment of armor had suffered much from exposure to wind and weather, but still there was no doubt that it came from a *Scaphirhynchus,* a sand sturgeon.

Later still, the same fisherman caught in the Arkansas River a specimen of the fish about two feet long. This Mr. Crump opened up, removed viscera and flesh, cured in salt, dried and sent to me by mail. It reached me in perfect condition, save that the tip of the upper lobe of the caudal was broken off. A glance at this splendid specimen showed beyond doubt that it was a shovelnosed sturgeon, a *Scaphirhynchus* and presumably a *platorhynchus.* But considerable study was necessary before it could be definitely said what form it is. This was because a closely allied form, *Parascaphirhynchus albus,* has been taken in the Mississippi River at Alton and Grafton, Illinois, and later at various points up the Mississippi River to Keokuk, Iowa. Compared with the better-known common shovelnose, this form is rare.

These two fish are differentiated mainly on many small unlikenesses, not very apparent unless they are before the student. These fine points can not be made out very well on a dried specimen, but there are enough major differences to enable me to say that these fish taken from the Arkansas River belong to the genus and species *Scaphirhynchus platorhynchus.* The common names given to it in various parts of the Mississippi Valley are the sand sturgeon, shovelnosed sturgeon, switchtail or hackleback.

Now comes the question as to whether this fish has ever before been taken in the Arkansas River, and further whether or not it has ever been recorded from any of the other rivers of the state.

Diligent search has been made through all the articles listing or describing fishes collected in Arkansas, and once only do I find it listed. However, so long ago as 1857 there was published "Reports of Explorations and Surveys . . . for a Railroad from the Mississippi River to the Pacific Ocean, Made . . .

1853–6," Vol. X, Zoology, containing "Fishes" by Charles Girard. On page 357 a young specimen is listed as collected by Dr. George C. Shumard near the mouth of the Poteau River in 1853. Elsewhere (p. 59 of special report No. 5) this fish is stated to have come from the Missouri River. Presuming that the first statement is correct, the atlas shows that the Poteau River rises in the western part of Arkansas, flows in a great circle west, north and northeast and empties into the Arkansas near to but west of Fort Smith, Arkansas. The specimen then was taken in what was at that time the Indian Territory, and is now Oklahoma. It then belongs in the Arkansas River drainage but was not collected within the state of that name.

The next reference is brief but definite. D. S. Jordan and C. H. Gilbert collected a specimen (no data given) in September, 1884, from the Red River at Fulton, Arkansas.[1] It is unfortunate that they confine themselves to merely listing the fish among those caught. Little more information is given by S. E. Meek,[2] who lists the fish on the authority of Girard, and of Jordan and Gilbert, but gives its habitat as "Mississippi Valley." There is no evidence whatever that he had ever collected the fish from Arkansan waters.

It is significant that in the 38 years since Meek wrote, the fish has never been recorded from the waters of Arkansas. From this one must judge that it is a rare fish. During a residence at Little Rock from 1895–1901, and in numerous visits there since I have never heard of it, although my interests in certain of its kindred fishes have led to much quest for information about these fishes.

Ganoid Fishes in Arkansas

In conclusion it is interesting to note that this short article makes a definite record for Arkansas of another member of the old group Ganoidei. Of these archaic fishes the following are known from Arkansan waters:

(1) *Scaphirhynchus platorhynchus*, the sand or shovel-nosed sturgeon;
(2) *Polyodon spathula*, the paddlefish or spoon-billed sturgeon;
(3) *Lepisosteus osseus*, the billfish or long-nosed gar;
(4) *Lepisosteus platostomus*, the short-nosed gar;
(5) *Lepisosteus spatula*, the alligator or broad-nosed gar;
(6) *Amia calva*, the grindle, bowfin or lawyer.

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[1] Proc. U. S. Nat. Mus. for 1886, 1887, Vol. 9, p. 14.
[2] A Catalogue of the Fishes of Arkansas. Ann. Rept. Geol. Survey, Ark. for 1891, Little Rock, 1894, Vol. II, Misc. Repts., p. 227.

DETERMINATION OF THE RELATIVE VOLUMES OF TWO COMBINING STREAMS FROM THEIR TEMPERATURES

From the law of heat transfer we know that if two volumes of water, V_1 and V_2, having temperatures of T_1 and T_2, are added together the combined volume will be $V_1 + V_2$ (called V_3), and their temperature T_3 will be given by the equation:

$$\frac{V_1T_1 + V_2T_2}{V_1 + V_2} = T_3$$

If two streams unite and their temperature and the temperature of the stream below the junction is taken, then their relative volumes in cubic units per unit time can be found by this same equation slightly simplified to fit the special situation.

Let A be one stream, B the other and C the stream resulting from the union of A and B. Also let V_1 be the volume in cubic units per unit time of A, V_2 of B and V_3 of C. T_1, T_2, T_3, are the temperatures of A, B and C, respectively.

$$1.\ \frac{V_1T_1 + V_2T_2}{V_1 + V_2} = T_3$$

$$2.\ V_1T_1 + V_2T_2 - V_1T_3 - V_2T_3 = 0$$

$$3.\ V_1(T_1 - T_3) = V_2(T_3 - T_2)$$

$$4.\ \frac{V_1}{V_2} = \frac{T_3 - T_2}{T_1 - T_3}$$

$$5.\ \frac{A}{B} = \frac{T_3 - T_2}{T_1 - T_3}$$

The substitution of the temperatures of these streams in equation 4 will give the relative volumes per unit of time of these streams in any case except where the temperatures of both streams are the same, but that case is sufficiently rare so that the calculation of relative volume by temperature will save much time and labor on water surveys, etc.

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DERMATITIS PRODUCED BY ENCELIA CALIFORNICA NUTT

In a recent number of Science, Dr. Munz[1] has called attention to a new case of a plant causing dermatitis. Perhaps there are other offenders of this sort common in our flora that should also be investigated. I wish to call attention to one such plant, the *Encelia californica* Nutt (Compositae), which I am sure causes severe dermatitis on some individuals.

One of my sons, on returning home for short inter-

[1] Phillip A. Munz, "Dermatitis Produced by Phacelia (Hydrophyllaceae)," Science, 76: 194, August 26, 1932.

vals, became affected several times with dermatitis to such an extent that he could not remain at home. Some near-by plant was suspected as causing the trouble, and several of the most common ones of the native vegetation on the dry hills surrounding the residence were tested. The method used was the crude but effective one of placing leaves against the forearm, held lightly in contact for a few minutes by a cloth band.

In this way it was found that when Encelia leaves were used the skin, which had been in contact with the unbroken leaf, soon turned red, in a few hours began swelling and finally broke out in blisters similar to those produced by poison ivy.

The other members of my family were apparently entirely immune to its influence, but I am thoroughly familiar with two other cases of individuals who are similarly affected by the same Encelia, one of them as severely as my son. Evidently the degree of susceptibility varies with the individual much as does that of ivy poisoning.

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QUOTATIONS

PROFESSOR ARTHUR H. COMPTON'S STUDIES OF COSMIC RAYS

THE Department of Public Relations of the University of Chicago has sent SCIENCE the following press release:

Professor Arthur H. Compton, University of Chicago physicist, has returned to his laboratory on the Midway with a trunkful of new data on the cosmic rays. Since March Dr. Compton has been roving the western hemisphere measuring the intensity of these remarkable emanations as they struck the earth at widely scattered sites.

Two results of his survey, neither of which fits the hypotheses which had been current as to the nature of the rays, were emphasized by Dr. Compton. The first of these is that the intensity of the rays is less near the magnetic equator than near the magnetic poles, which indicates that they are electrical in nature, rather than pure wave-forms.

The second is that the intensity of the rays apparently increases continuously at the higher altitudes, probably reaching a maximum at the top of the atmosphere. This is also held to be an argument against the pure-wave theory.

During the past twelve months Dr. Compton has taken measurements at sixteen major sites, while six further expeditions, under his direction, three of which have now completed their work, have made tests at sites throughout the remainder of the globe.

Dr. Compton's branch of the world-survey included measurements last autumn at Denver and other points in the Rockies; on the Jungfrau in the Swiss Alps, and in Chicago. This spring and summer he and his party have carried their instruments to the Hawaiian Islands, where Mount Haleakala was the major objective; the equatorial Pacific, where tests were made aboard ship; Auckland, New Zealand; Mount Cook, New Zealand, 1,000 miles from Auckland; Mount Kosciuski, Australia; Brisbane, Australia; Panama; Lima, Peru; Arequipa, Peru; Mexico City and neighboring peaks; Churchill, Manitoba, and the Fox Basin, Canada, where the measurements were made at the edge of the ice-pack, 100 miles north of the Arctic Circle.

The three cooperating parties which have completed their work are those of Professor R. D. Bennett, of the Massachusetts Institute of Technology, to Alaska, California and Denver; Professor J. M. Benade, of Punjab University, Lahore, to Ceylon, Sumatra, Java, Singapore, Tibet and India, and Allen Carpe, who was killed climbing Mount McKinley in Alaska. The three which have not yet reported are those of Dr. E. O. Wollan, of the University of Chicago, to Spitzbergen and Switzerland; Dr. A. LaCour, of Copenhagen, at Copenhagen and Greenland, and Professor S. M. Naude, of the University of Cape Town, to Mount Winterhoek in South Africa.

Two further parties will start in the near future, Dr. Compton has announced. Dr. E. P. Ledig, of the Carnegie Station, at Mount Huancayo, Peru, will go to the mountains of south Chile and the Argentine, and Dr. Thomas C. Poulter, of Iowa Wesleyan University, will go with Admiral Byrd's expedition to Antarctica.

During the past 12 months Professor Compton has traveled 50,000 miles, from latitude 46 degrees south to latitude 68 degrees north. He has crossed the equator four times and seen five continents.

Most important of the findings thus far assembled, according to Dr. Compton, is that the intensity of the rays is less near the magnetic equator than near the magnetic poles. This he had not anticipated. In the regions where Professor Robert A. Millikan, of the California Institute of Technology, had also made tests the Compton and Millikan measurements agree substantially. "In certain other areas, however," Dr. Compton said, "particularly in the tropics, our data give a new type of information."

The new data do not substantiate the tentative wave-form theory suggested previously by Millikan and Professor Jeans, of England.

In accounting for the difference between the intensity of the rays at the magnetic equator and the magnetic poles, Professor Compton pointed out that the earth is apparently acting as a huge magnet in relation to the rays.

"If the cosmic rays are electrified particles shot toward the earth from remote distances, as they seem to be," he said, "the effect of the earth's magnetic field will be to bend the rays away from the equator and concentrate them at the poles. This, for example, is what happens in the aurora borealis, which is due to electrons shot toward the earth from the sun. The electrons are concentrated near the earth's magnetic poles, and produce the 'northern lights' as they strike the upper atmosphere.

"If the cosmic rays are uncharged, like light rays or neutrons, they should not be affected by the earth's magnetic field."

The cosmic rays is a kind of radiation similar in effect to x-rays or rays from radium, Dr. Compton said. They come into the atmosphere from high altitudes, moving at a speed nearly equal to the velocity of light, which is 186,284 miles a second. They are observed by the fact that they make air and other gases electrically conducting.

"The rays do come from high altitudes, probably from outside the earth and possibly from interstellar space," Dr. Compton said, "though it is still as good a guess as any that they may emanate from the earth's upper atmosphere." Professor Compton found that the rays are slightly more intense in the day time than they are at night, which may lend some support to the theory that they are associated in some way with the sun, though other expeditions failed to find such an effect.

The minimum intensity of rays, according to latitude, was found at Lima, Peru, which is on the magnetic equator, 12 degrees, or about 800 miles, south of the geographical equator.

The second important result of the expedition was the observation that the rays increase in intensity continuously with altitude. "This would be expected if the rays were coming into the earth's atmosphere from outside and being absorbed by the atmosphere," Dr. Compton said. "If the rays had tended to diminish in intensity as the top of the atmosphere was approached, this would have been taken to support the wave theory."

The highest altitude where tests were made by Dr. Compton was at 19,000 feet on the volcano Mount El Misti, near Arequipa, Peru, though Professor Benade has since made tests 100 feet higher in the Himalayas. This is three miles higher than any cosmic ray mountain expedition has gone with equipment for precision work. The finding agrees with that made by Professor Piccard in his stratosphere ascension and also with the finding of Professor E. Regener, of Germany, who sent up a sounding balloon to 25 miles this spring.

One of the most significant new observations made during the summer was discovery of the sudden burst of ionization by individual cosmic rays in the apparatus. Using the burning of a single hydrogen atom in oxygen as a unit of energy, Dr. Compton said that the ionization of a radium atom would involve a million such units and the ionization of a cosmic ray several hundred millions of such units. Several hundred million volts potential would be required to produce such a ray artificially, he said.

During the tests on Mount El Misti, Dr. Compton and his wife and 15-year-old son, Arthur Alan, who served as his assistant, camped for a week at a temperature of zero and made tests 24 hours a day. On Mount Cook, in New Zealand, the heavy equipment had to be packed by the party over a mile of snow. In the Fox Basin, off Hudson Bay, probably the largest unexplored region on the continent, a new island 30 miles long was discovered by the Compton party, and named "Poole Island" for the captain of the tug *Ocean Eagle*, which carried the group.

The Carnegie Foundation shared the expenses of the expedition with the University of Chicago. The measuring device used was a steel chamber heavily sheathed with lead and copper, containing argon at 30 atmospheres pressure. An electrometer measured the varying conductivity of the argon. Dr. Compton was awarded the Nobel Prize for physics in 1927.

SCIENTIFIC BOOKS

The Theory of Electric and Magnetic Susceptibilities. By J. H. VAN VLECK. Oxford University Press, 384 pages, 1932.

THIS volume impressed the reviewer as being one of the most convincing gospels for the new quantum mechanics that he has read.

This does not imply that more apologia for quantum mechanics are needed at present, or that the works of Weyl and Dirac are not convincing in their way. But every so often, for the good of one's soul, one should go back to the experimental data which could not be made to fit the older theories and reconvince oneself that the newer theories are needed. When one is struggling with electron exchange in collisions and with spinor analysis, it is perhaps heartening to know that the beautifully straightforward methods of classical physics can not be used here, and to be certain that one has not somehow overlooked a much easier way of handling the difficulties.

Usually, one looks back to the history of the theory of radiation, to Planck's work, to the photoelectric effect and to the development of spectroscopy, to be reconvinced. This book shows that the development of the theory of the reaction of matter to static electric and magnetic fields forms just as convincing, and perhaps more understandable, a set of reasons for the necessity of revising the older theories.

This side of the argument for quantum mechanics is very little known, to some extent due to the fact that much of the original work was in the nearly

unobtainable form of doctor's dissertations in Danish and Dutch. Some of it should be better known, especially the disconcerting proof by Miss van Leeuwen that every substance obeying purely classical laws of motion must have a zero value of magnetic susceptibility, which is as far-reaching in its implication of the breakdown of classical theory in atomic processes as the work of Jeans, Planck and Einstein in the field of radiation. Professor van Vleck has rendered us a service by presenting this work.

His book also sets forth the difficulties of the older quantum theory and traces the curious mutations of the numerical factor in the term for the susceptibility due to molecules with permanent dipoles. The value 1/3 had been obtained by Langevin and Debye by sort of half-hearted use of classical theory. In the early quantum theory it became a larger quantity which apparently varied in an irritating manner with the presence of other fields. The new quantum mechanics restores the value of 1/3 and shows it to be independent of other fields, as experiment shows it should be. And so a formula which had been derived by a partial use of classical theory, which fits experimental data remarkably well, but which can not be obtained by a thoroughgoing use of classical methods, is now shown to be a correct consequence of the newer theories!

But of course the historical development of the subject is not the whole of the book. Most of the space is given over to elucidating the present theory and in showing its correspondence with the large amount of data available on dielectric constants and on magnetic susceptibilities.

Although the formula for the dependence of electric or magnetic susceptibility on temperature has remained intact, while the theory has been shifted under it, the resulting change has made us attach different meaning to some of the terms in the formula. For instance, the term "permanent electric or magnetic moment" really meant *permanent* in the older theory. The value of the constant μ in the Langevin-Debye formula meant the magnitude of the moment which the molecule possessed when it was at rest and undisturbed.

Now, however, Professor van Vleck has shown that many molecules which have a value of μ different than zero would have no moment if they were isolated and at rest. Ammonia is a case of this kind; the wave function of its lowest state is symmetrical, and so it can have no electric moment. The answer to the paradox is that the phrase "moment of an isolated molecule" has no meaning, since the molecule is no longer isolated if we try to measure its moment. The Langevin-Debye formula refers to the behavior of large number of molecules under the influence of a field. When the molecule is among others of its kind, it no longer stays always in its lowest state. If there are several possible states whose energy is not much different than the lowest energy, then as the molecule is buffeted by its neighbors it will be continuously changing from one state to another. If the molecule evidences a moment during these transitions, then this must be included in the moment μ which we label "permanent." If, on the other hand, the energy difference between the lowest state and the next lowest is large, then the buffeting will seldom change the molecule's state and it may not have a "permanent" moment.

This seems to be a far cry from the original concept of permanent moment, but the new concept seems to be the right one, for it explains the exceptions to the formula as well as the formula. If the difference between having a permanent moment and having none depends simply on whether the difference in energy between two states is large or small (compared to kT, the average energy of temperature motion) then, when the energy difference is neither large or small, queer things can happen. When Professor van Vleck first published his theory several years ago he showed that the nitrous oxide molecule was such a case, and by use of band spectral data predicted how its magnetic susceptibility would deviate from the normal law. Since that time several investigators have obtained data which fit his predicted curve of deviation remarkably well.

The paramagnetism of the rare earth ions in solution is also discussed, and the correspondence between theory and experimental data is given. The last chapters are concerned with ferromagnetism and allied subjects. Here is a field where electron spin and the Pauli principle play a predominating rôle, two phenomena which are completely outside the scope of classical theory. With their help much has been cleared up, although the subject of ferromagnetism is not in a satisfactory state yet.

The book is well written, and the derivations are clearly set forth. It would be quibbling to complain that the matrix methods the author seems so fond of are perhaps less familiar to many students than the purely wave-functional methods, or than the operator methods of Dirac, since the methods are so closely alike anyway. It is too bad, however, that he did not adopt Dirac's notation for his matrices, especially since this volume is in the same series with Dirac's "Quantum Mechanics."

As a whole, the book has an amount of connected unity and completeness which is gratifying in a book on modern physics. This is due to some extent to

the field it covers, which is fairly well delimited. But it is mostly due to the thoroughness of the author and his clarity. No matter what difficulties the reader may find himself entangled in, he will be sure to find, somewhere in the book, a footnote which will untangle him.

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SCIENTIFIC APPARATUS AND LABORATORY METHODS

A UNIVERSAL PRECISION STIMULATOR[1]

MODERN advances in the field of nerve physiology, involving high amplification of the action potential and its visual recording by means of the cathode ray oscillograph, have revealed that the customary methods of stimulation, especially at high rates, are unsatisfactory. Induction coils, condenser discharge systems, or in fact any system in which the essential circuit is interrupted by a mechanical key must of necessity prove unsatisfactory because keys do not close or open exactly the same each time, especially if they carry an appreciable voltage or current. Furthermore, the ordinary key will not operate accurately at frequencies greater than fifty per second. This contact difficulty is particularly serious when just-threshold responses are being observed at high amplification.

At the end of his very valuable review of all known methods of stimulation, Lullies[2] offers the opinion that the only satisfactory general methods of producing shocks of any desired characteristics are those involving photoelectric cells, such as that recently described by Nicolai.[3] In this method a rotating cylinder, patterned after the shape of the shock desired, interrupts a beam of light falling on a photocell, modulating an amplifying system, thus producing a shock. We evolved a similar apparatus independently, but abandoned this general method because of the extreme difficulty of obtaining quick shocks at low rates of stimulation, and because the large capacity between the stimulating circuit and ground makes the system unsatisfactory, especially for use with the cathode ray oscillograph. The gas discharge tube method is undesirable because of this capacity effect and because of the great difficulty of synchronizing the shock with externally applied excitation. We believe that the non-mechanical method described below[4] successfully overcomes all these difficulties.

Depending upon the position of switch S, the stimulator may be made to operate in either of two manners: (1) as a self-excited oscillator capable of stimulating at any desired rate, from once every few minutes up to 400 per second, or (2) by means of external excitation from any contact, such as that on the synchronizing rotator usually employed in connection with the oscillograph. We find this switch extremely handy. For example, in work on the effect of rapid stimulation on the after-potential of nerve, throwing it toward the short-circuiting position causes the nerve to be stimulated at any rapid rate desired; then, in order to examine the after-potential at any instant during the period of rapid stimulation, one has only to throw the switch in the other direction, in which case, with properly arranged amplification and synchronization, the after-potential may be examined or photographed. Switching back again to the short-circuiting position causes rapid unsynchronized stimulation to be resumed, the entire interruption lasting only a few seconds.

Considering the apparatus first as a self-excited oscillator, the essential mechanism is as follows: A condenser C charges through a resistance R until the critical ignition voltage of the Thyratron is reached, a value controlled by the grid bias, P. Having attained this potential, the mercury vapor becomes ionized, permitting condenser C to empty itself into the primary of T. This heavy current surge, having emptied the condenser, the Thyratron de-ionizes and the cycle is completed.

The current induced in the secondary of T then serves to stimulate the nerve or muscle, the intensity of the shock being determined by the relation of the variable resistance Ω to the fixed resistance, ω. If a L and N, four dial, 10,000 ohm resistance box is used for Ω, the strength of the shock may be graded in extremely small steps over a very wide range. This arrangement is particularly useful for work where the intensity of stimulation must be very accurately adjusted, as in studies on the single axon response. Actually, assuming a fairly high tissue resistance, the shock strength may be made almost directly proportional to Ω, by substituting a similar four dial resistance box for the fixed resistance, ω, and by adjusting the setting each time on Ω and ω so that the sum of the two resistances remains constant.

If the stimulator is to be actuated by an external contact, such as that on the rotator of the usual oscillograph synchronizer, the switch, S, must be thrown so as to include the secondary of the small step-up

[1] From the Department of Zoology, Washington University, St. Louis, Missouri.

[2] H. Lullies, *Handb. d. biol. Arbeitsmethoden*, Abt. V, Teil 5 A, Heft 6, 937, 1931.

[3] L. Nicolai, *Pflügers Archiv*, 225: 131, 572, 1930.

[4] The construction of this apparatus was made possible by a research grant to Washington University by the Rockefeller Foundation.

transformer, *t*, in the grid circuit, and the grid bias must be adjusted sufficiently negative to prevent automatic discharges. Upon closing contact, *Ct*, a surge is induced in the secondary of *t*, which is sufficient to ionize the Thyratron, thereby producing a shock. Since the Thyratron is activated only by a positive grid surge, either the make alone or the break alone will bring about ionization; this prevents stimulation by *both* the make and the break of the contact. It should be noted that the shock is absolutely independent of the character of the contact made through *Ct*. If contact is made at all, the Thyratron will ionize, and the shock produced will have characteristics determined only by the plate circuit.

In the manner just described, it is possible to apply this stimulator to the usual oscillographic equipment, simply by connecting the contacts of the rotating synchronizer, in the primary circuit of transformer *t*. Shocks are thus synchronized with the spreading mechanism and each nerve impulse is recorded on the oscillograph tube.

At high rates of stimulation it is obviously impossible to obtain synchronization by the usual mechanical means. We have therefore designed an entirely non-mechanical system by means of which each shock produced by this stimulator may be synchronized automatically with a spreading circuit.[5] By the use of a master oscillator, it is possible to vary the frequency of stimulation and of spreading, the speed of the line, and the position of the image on the tube, all independently. Such synchronization of each action potential at high rates of stimulation greatly facilitates photographic recording of fast waves.

This stimulator may truly be called universal for the following reasons: (1) The rate of stimulation may be varied without changing the shape or the intensity of shock, simply by changing the resistance, *R*, or the "B" voltage; (2) the intensity of the shock may be changed without affecting any of the other characteristics, by adjustment of resistance Ω; (3) the shape and duration of shock may be varied by changing the condenser *C*, or by replacing the primary of *T*, by a readily interchangeable coil of different characteristics; (4) the duration of the shock may be reduced to a value less than 0.1σ because of the rapidity of the ionization of the mercury vapor; (5) owing to the fact that currents as high as 25 amperes may be passed momentarily by the Thyratron, high intensities of shock are realizable; this is a necessary feature if the shock is to be of short duration, and is a feature not possessed by other methods using gas discharge tubes, such as neon tubes; (6) the shock produced when the mechanical contact is closed is entirely independent of the nature of the contact; (7) owing to the fact that the secondary of *T* is not connected to ground, but is free floating, the shock

[5] We expect to publish the details of this circuit shortly.

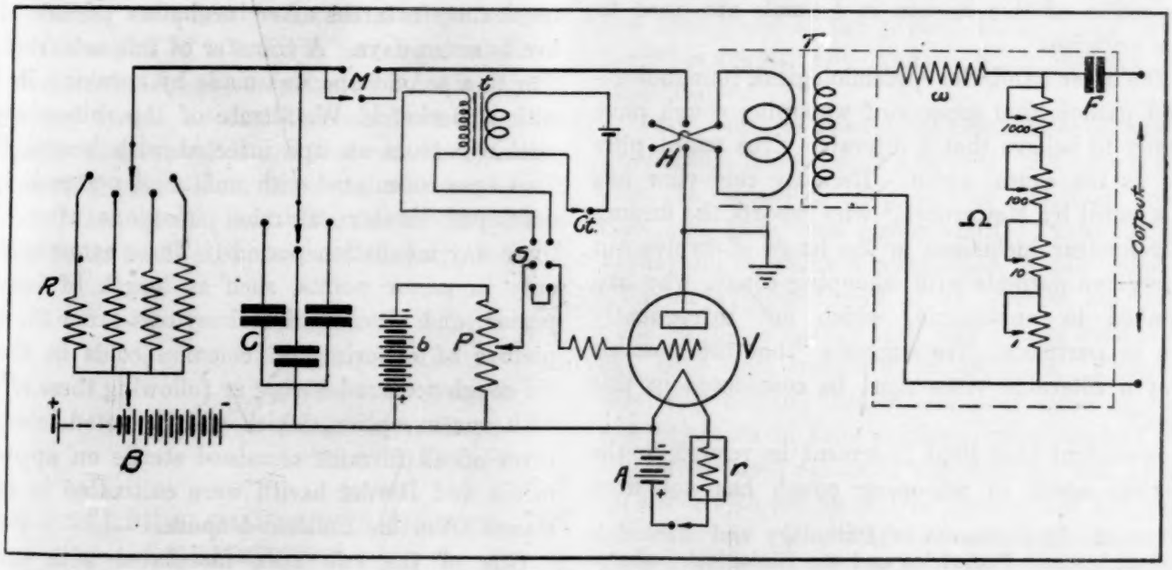

FIG. 1

A, 6 volt storage battery; (the use of alternating current and transformer to heat Thyratron filament is avoided because of the interference introduced into the oscillograph at high amplification); *b*, bias battery; *B*, 45–180 volt "*B*" battery; *C*, bank of 10 condensers from .001 to 2 m.f.d.; *Ct*, mechanical contact (synchronized with oscillograph spreader); *F*, condenser to block polarization currents; *H*, switch to reverse direction of shock; *M*, terminals to marking key for time recording; *P*, potentiometer to control ignition voltage of Thyratron; ω, fixed resistance (2,000 ohms); Ω, 4-dial L–N 10,000 ohm resistance box; *r*, 5 amp. ballast resistor; *R*, resistor bank (50,000 to 5 meg); *S*, double pole double throw switch; *t*, 16: 1 step-up transformer; *T*, air core transformer; *V*, Thyratron tube, type F.G. 57.

artifact as seen on the oscillograph tube is reduced to an absolute minimum.

Finally, it might be pointed out that the circuit shown in Fig. 1 may find numerous other applications besides that of nerve or muscle stimulation. For example, by connecting an electro-magnetic marking key to the binding posts at (*M*), it is possible to record the moment of stimulation on a kymograph or similar apparatus. Furthermore, the unit may be calibrated and adjusted to mark any desired time intervals, from a frequency of once in fifteen minutes to the limiting frequency of the key. The entire apparatus, equipped for use as a stimulator and as a time recorder, may be enclosed in a small portable box suitable for research or for student use. If the device is to be used for nerve or muscle stimulation without oscillographic recording, the Thyratron filament may be heated by alternating current through a small transformer, rather than by a storage battery. The "B" batteries may likewise be replaced by an A.C. power pack, thus enclosing power supply and all in one box. Used as a master time recorder such a unit will turn out sufficient energy to operate a number of marking keys of the usual type.

OTTO H. A. SCHMITT
FRANCIS O. SCHMITT

SPECIAL ARTICLES

EXPERIMENTS UPON THE CAUSE OF WHOOPING COUGH[1]

IT is an accepted observation that it is frequently impossible to differentiate the symptoms and signs of the catarrhal stage of whooping cough from those of the common cold.[2]

Although the Bordet-Gengou bacillus is widely regarded as the specific etiological agent of whooping cough, it is fair to say that carefully controlled proof of this belief is scant. With the exception of the report of Sauer and Hambrecht,[3] in which it is stated that a characteristic paroxysmal cough had been produced in eight out of twenty-eight monkeys inoculated with *B. pertussis,* the reports of the experimental reproduction of this disease in animals are open to serious criticism.

On the other hand, the epidemiological, immunological and pathological aspects of whooping cough have led many to believe that a filterable virus might play a rôle as the causal agent. Recently this view has been stressed by McCordock,[4] who reports the finding of intranuclear inclusions in the lungs of twelve out of thirty-five patients with whooping cough, who had succumbed to pneumonia, which not infrequently occurs in pertussis. He suggests "that the possible rôle of a filterable virus must be considered in this disease."

It is evident that final judgment in regard to the etiological agent in whooping cough has not been reached, and it was with this in mind that we commenced our investigations upon the problem of pertussis.

Chimpanzees have been used in all the transmission experiments because of their well-known susceptibility to human diseases. During experimental periods the animals were in strict isolation, and rigorous precautions against cross infection were exercised by the attendants and observers.

Three apes, inoculated by spraying their throats with either Berkefeld V, W, or Seitz filtrates of sputum from early human cases of whooping cough and by subcutaneous inoculations of citrated blood from the same patients, developed febrile upper respiratory catarrhs after incubation periods of from five to seven days. A transfer of this catarrhal infection to a second ape was made by spraying its throat with a Berkefeld W. filtrate of the rhinopharyngeal washings from an ape infected with human filtrate. Two apes inoculated with unfiltered pertussis sputum developed similar catarrhal affections after two or three day incubation periods. These catarrhs differed only in minor points, such as length of incubation period, and absence of leukocytosis from the typical picture of experimental common colds in the apes. No cough occurred during or following these affections with one exception, which will be noted later. Cultures of all filtrates remained sterile on appropriate media and Bordet bacilli were cultivated in each instance from the unfiltered sputa.

One of the two apes inoculated with unfiltered sputum developed a second catarrhal affection thirty days after being inoculated. Within a few days a typical paroxysmal cough appeared and was accompanied by a leukocytosis and a marked absolute increase in the lymphocytes. Cough plates on Bordet medium on several occasions showed numerous Bordet bacilli. The cough lasted for seven weeks. Another

[1] From the Departments of Pathology and Bacteriology, Medicine and Pediatrics and the Biological Laboratory of the John J. Abel Fund for Research on the Common Cold, The Johns Hopkins University Medical School, Baltimore, Maryland.

[2] "Osler's Principles and Practice of Medicine," McCrae. Tenth edition. D. Appleton and Company, New York.

[3] L. W. Sauer and L. Hambrecht, *Am. J. Dis. Child.,* xxxvii: 732, 1929.

[4] H. A. McCordock, *Proc. Soc. Exp. Biol. and Med.,* xxix: 1288, June, 1932.

ape was allowed to drink a heavy suspension of freshly isolated Bordet bacilli. After an incubation period of twenty-four days, this ape developed typical whooping cough. The cough was accompanied by a marked leukocytosis and an absolute increase in the lymphocytes. Cough plates were positive for Bordet bacilli. The cough endured for six weeks. A third ape, which was inoculated with third generation cultures of Bordet bacilli isolated from the previous ape, developed typical whooping cough after an incubation period of seven days. Again, the cough was accompanied by a leukocytosis which at its height showed 63,000 white blood cells with an absolute increase in the lymphocytes to 44,730 cells. Cough plates were covered with Bordet bacilli. The cough persisted for six weeks. In all three apes, the complement-fixation reaction with pertussis antigen, which was negative during the incubation period, became strongly positive after the disease was well developed. Berkefeld W. filtrates of the rhinopharyngeal washings taken during the catarrhal stage in two of these three apes and inoculated into other apes did not produce catarrhal affections.

The interpretation of these observations is difficult. There can be no doubt but that the three apes inoculated with pure cultures of Bordet bacilli or whole sputum developed typical whooping cough, which in its clinical and bacteriological aspects was indistinguishable from the human disease. However, the results in those apes inoculated with filtrates from human cases are inconclusive and are open to two interpretations. One, that the catarrhal affections represented the action of a hitherto unrecognized filterable virus which acts as the primary infecting agent in whooping cough, or that the catarrhal affections were simply common colds and that we were dealing with whooping cough cases who were also carriers of the virus of the common cold. Further investigations are being made upon all aspects of the experimental disease.

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AN ENCEPHALOMYELITIS IN THE CHICKEN[1]

A NERVOUS disorder of chickens, in the form of a pronounced and rapid tremor of the head and neck with which, in some cases, there is also an associated ataxia, was first seen by us in May, 1930, when a group of nine diseased chickens was brought to the laboratory. In April, 1931, a second group of affected birds was received, a third in January, 1932, and a fourth in May, 1932. Throughout the spring of 1932 reports of the wide-spread occurrence of this disease have been frequent.

In an affected flock, the first symptom of the disease to be observed is the rapid tremor of the head and neck in certain birds. On manual examination, other muscles are found to be involved as well. The "trembling" becomes aggravated when the chickens are excited, tends to subside when the birds are left to themselves, and disappears in sleep. In some chickens the tremor is very fine, in others coarse; in some it is intermittent in character, in others it appears to be constant during their waking hours.

An ataxia was present in addition to the tremor in some of the birds when they were brought to the laboratory, and developed in others while they were under observation. An occasional bird, showing the tremor only, gradually recovered, and at the end of two to three months appeared to be normal; others continued to show the tremor over the same period; but those affected with an ataxia in addition to the tremor grew progressively worse, and sometimes within a week after onset of the ataxia were moribund.

The age of onset of the disease has been reported to be as early as two days after the chickens had been removed from the incubator. The youngest birds brought to us were five days old when we received them, the oldest, six to seven weeks.

A total of 102 affected birds have been studied. Detailed pathological examination of fifty of these has been made at the present time. Over thirty of the birds are still alive and are being used for further experiments.

Work with the disease has included experiments on production, transmission and cure. All efforts to produce the disease *de novo, i.e.,* by diet, high temperature, etc., have been unsuccessful. Transmission experiments, in which a suspension in salt solution of brain or of spinal cord of an affected bird was inoculated intracranially into very young normal chickens, have been successful in six cases. Typical disease with marked tremor and poor sense of balance was produced in four chickens; with marked tremor and pronounced ataxia in one chicken; and an atypical form with ataxia and no tremor was produced in one chicken.[2] The first two successful inoculations were made from suspensions of the cord from two chickens in the group brought to the laboratory in January, 1932. Inoculations with a brain suspension in each of these two cases were negative. The first

[1] Preliminary report.

[2] The lesions of the brain and spinal cord of this chicken were numerous and large. They were indistinguishable from lesions occurring in chickens with typical manifestations of the disease, *i.e.,* both tremor and ataxia.

inoculated bird to show the disease was chloroformed the day following that on which positive diagnosis of disease was made, symptoms having been observed two days earlier, twenty-eight days after inoculation. When killed, the tremor was pronounced, and the right leg somewhat ataxic. A suspension of the brain of this bird was made in salt solution and inoculated intracranially into each of four birds, and a suspension of cord was likewise inoculated into four birds. None of these had developed the disease at the end of six weeks when they were killed. Autopsies were performed and material for pathological examination saved in all cases.

The second inoculated bird to show the disease developed a tremor twenty-nine days after inoculation and was killed seven days later. A suspension of brain from this bird was inoculated intracranially into each of ten chickens, and a suspension of cord similarly into each of eleven chickens. None of those inoculated with the suspension of spinal cord developed the disease, but of those inoculated with the suspension of brain, one developed a distinct ataxia after twenty-eight days, and a second developed a marked tremor and poor sense of balance but no real ataxia after twenty-nine days.

These birds were chloroformed, one six days after the tremor appeared, the other five days, and a suspension of brain or of cord was inoculated intracranially into each of sixteen birds. One of the birds inoculated with cord suspension from the bird with tremor and no ataxia developed a fine rapid tremor thirty-four days after inoculation. Forty days after inoculation one of those inoculated with cord suspension from the bird showing ataxia and no tremor showed a fine tremor. Further inoculations are being made from the brain and the cord of each of these two chickens.

All the birds developing the disease after inoculation exhibited numerous lesions in both brain and cord. These lesions are typical of the disease and closely resemble the early lesions found in naturally affected birds. The inoculation experiments are being continued.

No method of curing the disorder has been discovered. In rare instances, birds have apparently "outgrown" the disease, but in the majority of cases either the tremor continues unchanged in intensity, or an ataxia develops which becomes progressively more severe until the bird is incapacitated.

The pathology[3] of the disease is not confined to the brain and spinal cord, although the lesions found there are constant in occurrence and type, while those occurring in the viscera vary in size and distribution. The lesions in the brain and spinal cord consist of focal collections of neuroglia cells around capillaries, perivascular infiltrations and degeneration of nerve cells. The neuroglia cells comprising the focal accumulations are chiefly macroglia and oligodendroglia, with an occasional microglia cell. Mitotic figures are frequently seen, indicating the proliferative nature of the lesion. These focal collections of glia cells are found in all parts of the brain and spinal cord, although fewer are found in the cerebellum than elsewhere.

The lesions in the viscera consist of microscopic areas of infiltration with lymphoid cells. These areas are either rounded and sharply circumscribed, or irregular in outline. Many of the cells, especially in the circumscribed areas, resemble lymphoblasts. Mitotic figures are often found, and also many pycnotic nuclei. The pancreas and heart are the organs most severely affected by these infiltrations, but liver, spleen, kidney, testis and other organs are also involved in varying degrees.

Further experiments on production and transmission of the disease are now in progress, and pathological studies are being continued. A complete account of the work will be published at a later date.

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[3] The pathology of the brain and spinal cord has been worked out by Dr. Myrtelle M. Canavan, of the Department of Pathology of the Harvard University Medical School. Dr. E. E. Tyzzer, Dr. S. B. Wolbach and Dr. Stanley Cobb have also examined many of the sections.

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